AIR ENGINEERING

OCTOBER, 1961
VOL. 3, NO. 10

AIR QUALITY CONTROL . . . FOR COMFORT, PROCESS AND PROFIT

- How Increased Production Affects Ventilation p. 18
- Guide To Design Of Hot Air Door Curtains p. 22
- Process Air Control Ups Product Quality At Formica p. 24
- Case For Professional Air System Balancing p. 27
- Industrial Heat And Its Control p. 30

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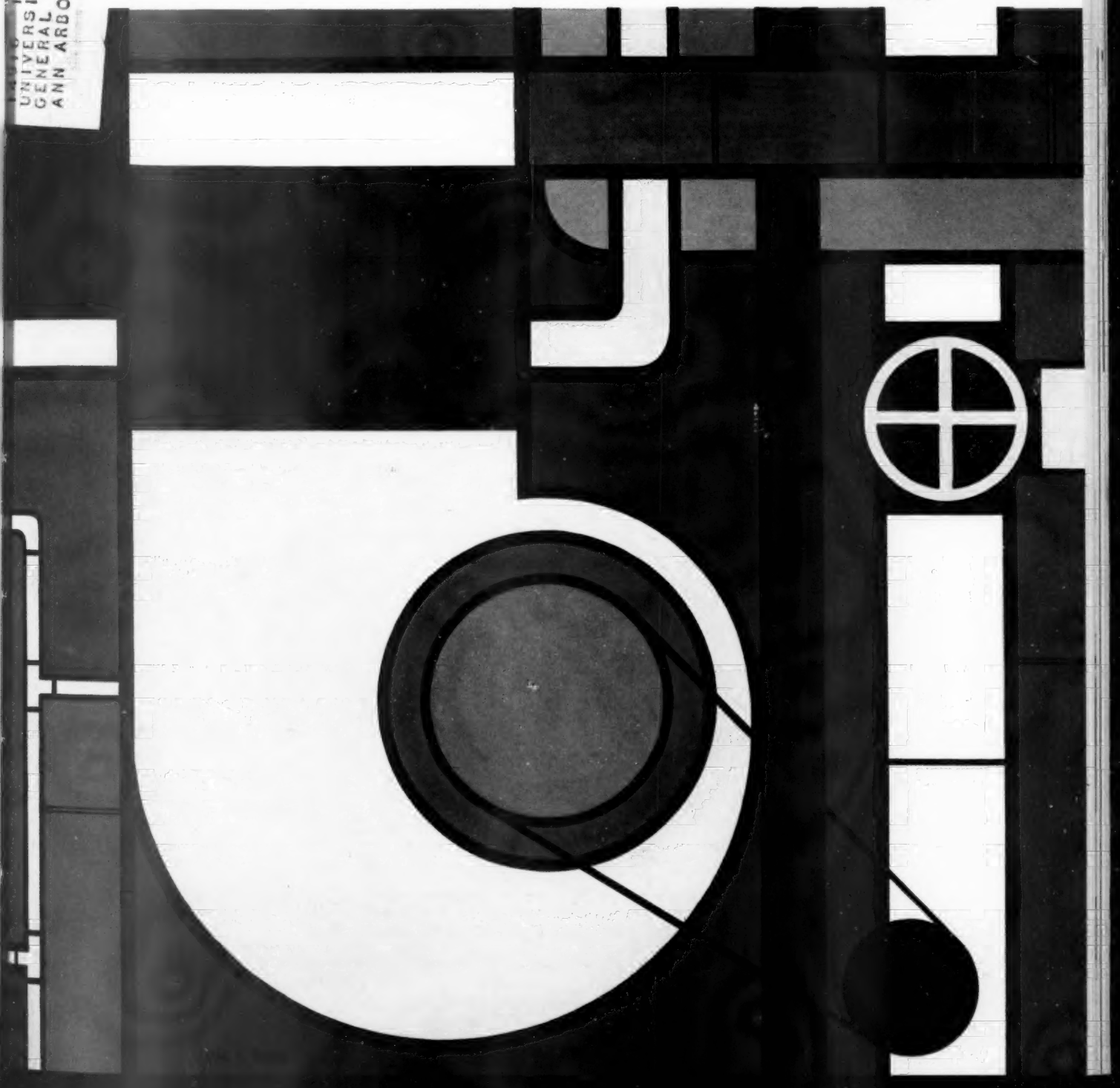

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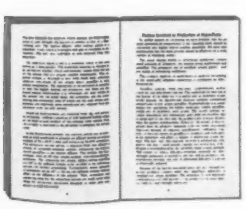

Learn the facts *about fume and odor control . . . and the benefits of a Catalytic System. Send for our descriptive brochure, write "Department D."*

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[For more information circle #11 on page 35 reply cards]

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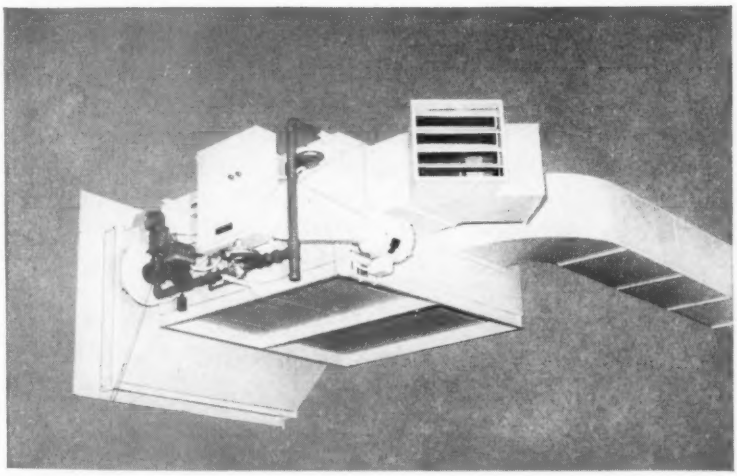
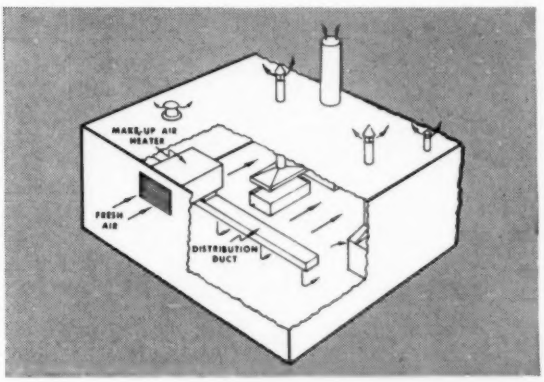


Typical "packaged" make-up air heater mounted overhead in unused space, with intake air coming in through area where window has been removed.

For heating the fresh outside air required for replacement of that exhausted from industrial plants to remove dust, fumes, vapors, and other contaminants.



For complete information on solutions to this and other make-up air problems, write for Bulletin AS-62, or see your MAXON Application Engineer.

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[For more information circle #12 on page 35 reply cards]

Letters

Electronic Firm Wants White Room Information

Editor:

We are in the electronics business and find that as specifications and designs of units become smaller and smaller and specifications more and more critical we require cleaner and cleaner facilities for the production of our products. Recently, a representative from one of the larger air cleaning companies left me a copy of your magazine.

We would like very much to get in touch with a company who makes a business of installing "white rooms." Someone who can take the complete problem from the design stage all the way through the engineering and give us a "white room" ready to go into full operation.

It was my thought after going through your magazine that you people certainly would know of such an outfit if anyone would and I certainly would appreciate your assistance in this matter.

W.H.O.

Watch for the November issue of AIR ENGINEERING *containing a complete Directory of Supplies and Equipment for Contamination Control.*

New Subscription From An Old Friend

Editor:

Enclosed find my M.O. of $4.50 to cover two years' subscription of AIR ENGINEERING.

I have been receiving AIR ENGINEERING at my company office regularly for sometime, and have found it both interesting and valuable in my work here at the plant. Thus to be sure that I may receive AIR ENGINEERING regularly, and to show my appreciation for the past issues, I want to become a regular AIR ENGINEERING subscriber.

A.A.

Enjoyed Air Ionization Article

Editor:

Thank you so very much for the splendid article on negative air ions on page 30-31 of the August issue. Not only is it of timely interest but the presentation is scholarly and comprehensive. More, please?

T.F. McD.

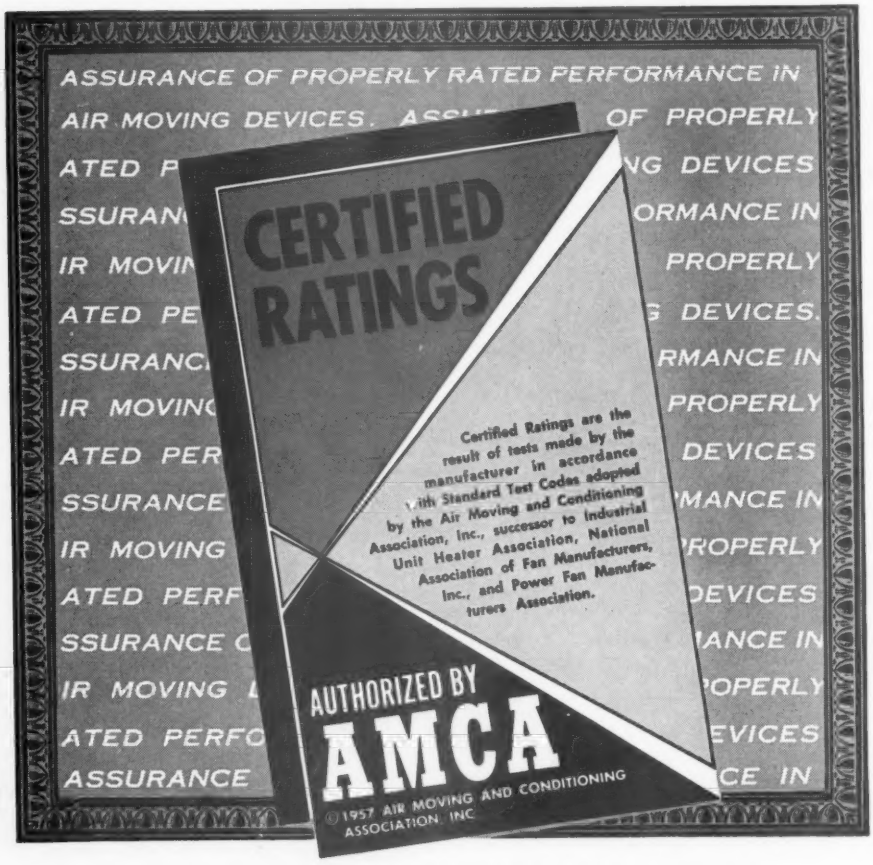
Special Report On White Rooms

Editor:

Would it be possible for me to purchase 300 copies of your white room report for distribution to our sales organization throughout the United States? This contains a very complete and interesting factual story on white rooms, of which we have had the pleasure of supplying quite a few during the past couple of years, as shown by the enclosed photograph.

L.H.A.

To receive a copy of the white room report, circle #176 on page 35 postage-free reply cards.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A CONTINUING RE-TEST PROGRAM IS BEHIND THIS SEAL—All products licensed to use the certified ratings seal are subject to periodic re-evaluation under AMCA's continuing re-test program, and license to use the Seal may be withdrawn by AMCA for non-conformance with requirements.

Copies of Bulletin 261A, "Who's Who in Certified Performance Ratings" are available from: Air Moving and Conditioning Association, Inc., 2159 Guardian Building, Detroit 26, Michigan.

[For more information circle #13 on page 35 reply cards]

AIR ENGINEERING

VOL. 3, NO. 10

OCTOBER, 1961

AIR QUALITY CONTROL . . . FOR COMFORT, PROCESS, PROFIT

FEATURES

What Happens To Ventilation When Production Increases 18

by John Soet, Director, Div., Occupational Health, Michigan Dept. of Health. Mr. Soet, a registered professional engineer, tells what to do about ventilation when production increases. He uses several types of industries as illustrative case histories.

How To Design Hot Air Door Curtains 22

by Lowell F. Crouse, vice president, Maxon Premix Burner Co. Usable data on air velocity, temperature, humidity, for covering large door openings with blasts of hot air from slotted or louvered outlets.

Process Air Control At Formica 24

by John Trepkus, power plant engineer, Formica Corp. Temperature and humidity regulation are vital to quality lamination of plastic sheets for Formica panel make-up. Author tells how process air conditions are maintained in his plant.

The Case For Professional Balancing Of Big Building Air Distribution Systems 27

by William N. Jacobs, Jr., William N. Jacobs Associates, Inc., architects, engineers. An excellent summary of the problems of balancing complicated air distribution systems and how they can be solved by a firm of professional balancers.

Industrial Heat And Its Control 30

by Robert Lemke, mechanical engineer. Last of a four part series dealing with evaluation and control methods for curbing excessive heat gains from industrial processes. This installment takes up air conditioning and evaporative cooling.

DEPARTMENTS

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COVER

An abstract painting of air moving equipment, this month's cover symbolizes the total concept of air treatment that guides the editorial policy of AIR ENGINEERING . . . cooling, heating, cleaning, filtering, distributing, for process & health.

AIR ENGINEERING is published monthly by Business News Publishing Company, at 450 West Fort Street, Detroit 26, Michigan. Subscription prices: United States, Canada: $3.00—1 year; $4.50—2 years; $6.00—3 years. Foreign: $5.00—1 year; $8.50—2 years; $12.00—3 years. Single copies 50 cents. Second-class postage paid at Detroit, Michigan. First issue April, 1959. • CHANGE OF ADDRESS. Notify AIR ENGINEERING and your local Post Office of both your old and new addresses including postal zone numbers by 12th of preceding month.

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? ? ? ? ? ? ? Questions & ANSWERS ? ? ? ? ? ? ?

Lead Soldering Of Copper Pipe

What are the problems involved in lead soldering of copper pipe?

In any operation where lead or lead-tin alloys are heated with a direct flame or torch the lead can be vaporized by overheating. However, a skilled worker may be able to just attain the melting point minimizing the exposure. The fact the solder contains 50 percent or less of lead and the remainder tin does not exclude the vaporizing of lead, with fume production, although it does lower the melting point and reduce the formation of lead oxide.

The article from January, 1960, *Industrial Medicine & Surgery* entitled "Air Pollution from Soldering Fumes" is an interesting article, of which several points are to be noted as listed in the following:

- It is the report of only one plant.
- Soldering is done by "tinning" dipping in molten baths. (These baths lend themselves to rather precise thermostatic temperature control.)
- No torch soldering was mentioned. (This process is controlled only by human skill.)
- Some "local" ventilation was applied.
- Medical controls were by coproporphyrin and basophilic granulation studies. These are helpful adjuncts to diagnosis but are considered not as reliable or specific as blood lead studies.

There are several studies indicating the hazards of lead soldering, one study by a governmental agency included inspections and air determinations in 84 different plants. In this study 21 air determinations made at torch soldering operations show 9 samples above 1.5 milligrams of lead per 10 cu meters of air and 4 samples above 4.0 milligrams per 10 cu Mg indicating as previously stated, high or low exposures may be encountered. The authors*, conclude in the summary with the following comment: "In all types of lead soldering dangerous quantities of lead may be dispersed in the workroom air." In the light of this article and other supporting references on lead soldering it would be well to view the operation with caution, so that proper measures be applied to keep the air concentration of lead at an acceptable level.

REFERENCES

**Daubenspeck, Walker G., Soldering Operations, Industrial Medicine, October, 1944, Vol. 5, No. 4, pp. 880.*

Harrold, Gordon C. The Engineering Control of Lead Contaminated Environments, Industrial Medicine Section 10: 34-39, 1941.

Wisconsin State Board of Health, Industrial Hygiene Unit. "The Lead Hazard in the Milk Canning Industry."

Michigan Department of Labor and Industry, Health Hazards in Soldering Operations, March, 1945.

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For improved working conditions and increased production in work areas where process requires heavy exhausting.

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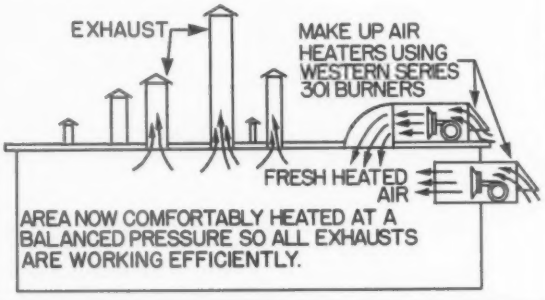
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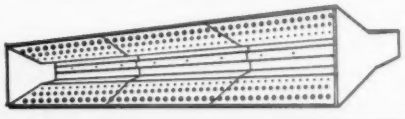

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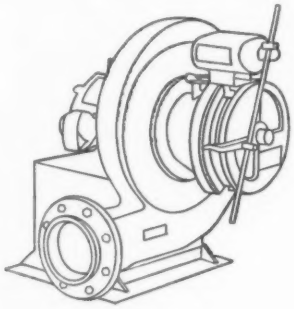

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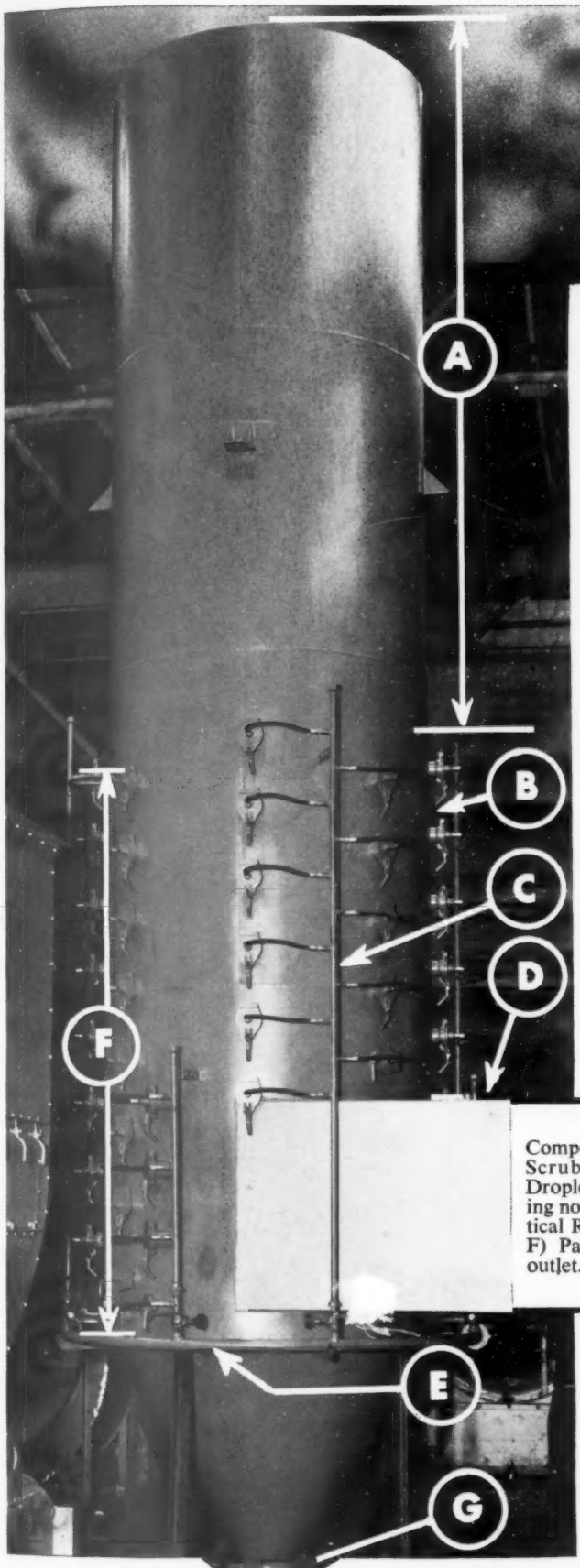

DENSE FUMES

ON JOB REMOVED BY 'BUFFALO' HYDRAULIC SCRUBBING TOWERS

Here's how an aircraft plant solved a critical contaminant problem. 35,000 and 50,000 ton hydraulic, closed die forge presses are used to produce large aluminum components for the aircraft industry. Fumes (dense smoke, oil mist and graphite particles) are released as the presses are operated.

Four specially-designed 'Buffalo' Hydraulic Scrubbing Towers were utilized. Each is rated at 65,000 CFM and 1.5″ w.g. The spray system recirculates 250 GPM at 100 psi.

Before installation, the entire work area was completely covered with an oil slick. The stack effluent was termed a nuisance. Since installation, the work areas are clean. The stack effluent is negligible. Operation of the 'Buffalo' Hydraulic Scrubbing towers and laminates over 90% of the contaminants.

Component parts of the 'Buffalo' Hydraulic Scrubbing Tower are: A) Collection and Droplet Elimination Section. B) Quick-opening nozzle latches with flexible piping. C) Vertical Risers. D) Inlet. E) Spray manifold ring. F) Particle conditioning section. G) Waste outlet.

'Buffalo' Hydraulic Scrubbing Towers are high efficiency, wet centrifugal air cleaning devices specially designed to solve your fume removal problems.

They utilize : 1) A finely atomized spray system for particle conditioning. 2) Inertial separation of the contaminant from the gas stream in a cylindrical tower.

Whatever your air pollution problem, call in your 'Buffalo' resident engineer. He will be glad to help you solve it — efficiently, economically.

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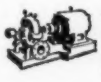
BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

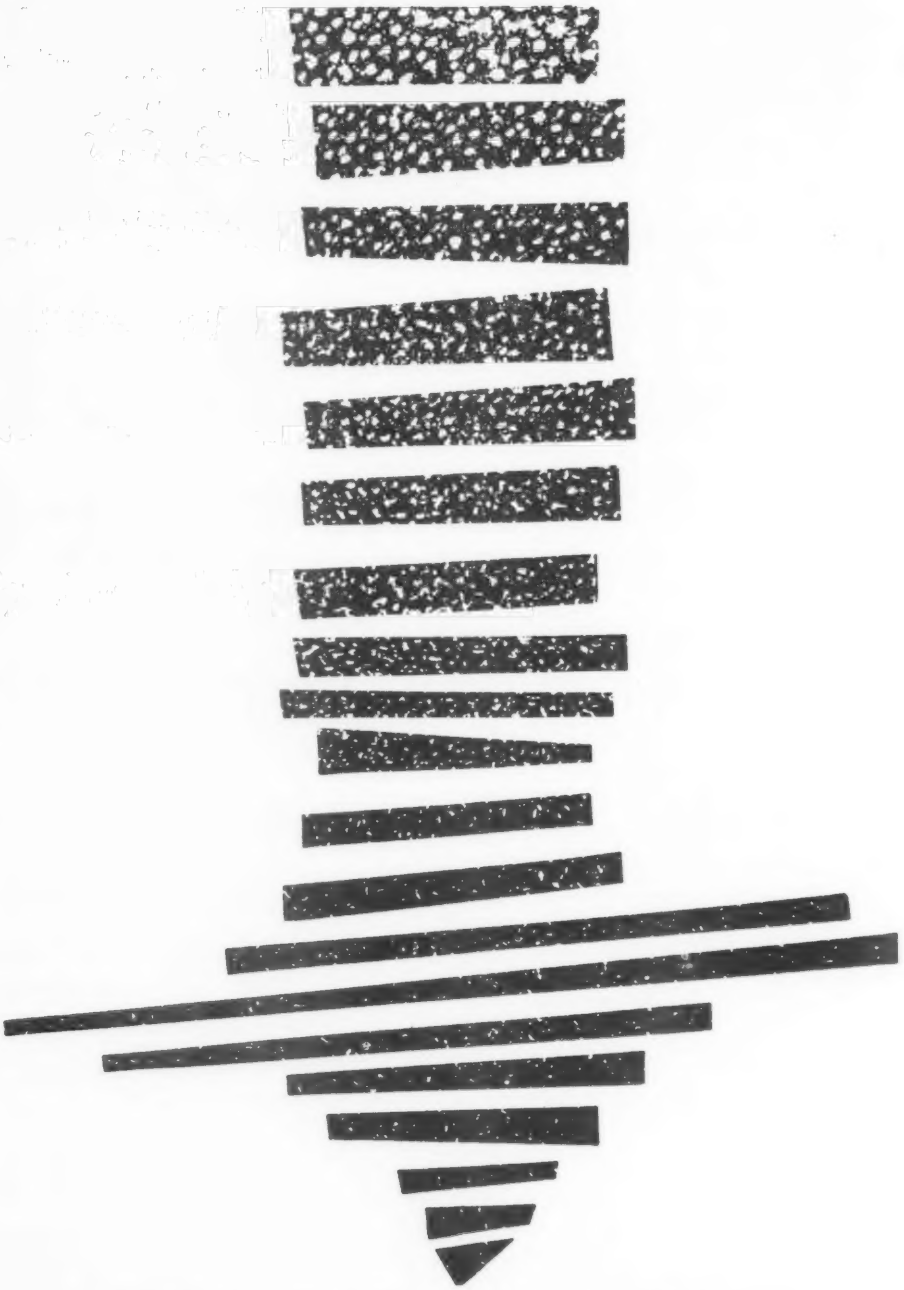
'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.



'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

[For more information circle #15 on page 35 reply cards]



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The Sub-Micronosphere is the mystifying and challenging province of the small dust and fume particle, the "Submicron," which never exceeds 1/25,000" in size. Submicrons are elusive, wily and extremely difficult to capture... unless you use the right technique. Conquerors of the Sub-Micronosphere have found the Ducon Oriclone Scrubber to be a most effective weapon. It has captured Submicrons by the millions. The Oriclone is a new type of high energy scrubber... smaller... more economical... yet more effective than other units. It is the ideal collector for fine dusts and fumes.

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EDITORIAL:

Why Treat Gyros Better Than People?

WE SEEM to be more concerned with protecting the delicate innards of gyroscopes from contaminating airborne *dirt* . . . than we are about protecting the health of people in hospitals against contaminating airborne *bacteria.*

We cheerfully pay heavy taxes so defense industries can build elaborately sealed and interlocked "White Rooms," where even a single bacteria smaller than one micron (less than $\frac{1}{25000}$th in.) is kept out of super-precise and micro-miniaturized components. Upwards of $100 per square foot for these white rooms is willingly paid so a tiny speck of dust won't cause a missile component, and so the missile itself, to malfunction in flight.

Cost of the mechanical equipment and special construction for white room type containment of airborne bacteria in hospitals, would undoubtedly be far greater than conventional air handling and air conditioning equipment and building construction.

However, in our opinion this additional expense need not add to overall hospital cost if the benefits therefrom can be rationalized as being greater than those obtained from elaborate lobbies, reception rooms and large parking lots.

We are not arguing the logic of spending $200,000 or so for plant facilities that will save a multi-million dollar space probe effort from destruction.

We do want to point out the fallacy of not applying the techniques that keep sub-micron dust out of missile components to keeping bacteria out of humans in hospitals. After all, surely one human life is more important than a million dollar missile or a fancy space-wasting hospital lobby.

Lest anyone argue that hospitals are, after all, pretty safe places in which to be, let us point out that the spate of serious, not to mention lethal, infections caused by drug resistant staphylcoccus aureus bacteria, is the great concern of hospital authorities today.

Careful counts in operating rooms have shown a higher incidence of infectious bacteria in the surgery during an operation than in rooms outside the surgery.

For example, up to 150 bacteria per cubic foot were found in an operating theatre, only 10 to 50 bacteria per cubic foot in a nurses' station. While the full significance of high bacterial counts to infection of open surgical wounds has not been thoroughly

(Please turn to following page)

Editorial

(Continued from preceding page)

established, the relation of reduction in wound infection rates and reduction in airborne bacteria counts has been noted.

There is no doubt that airborne contamination exists in hospitals and that it is a serious problem. There is no doubt that architects and consulting engineers can protect patients against the hazards of airborne bacteria by many of the same methods we protect missile gyros against airborne dust.

We need to examine what can be done to hospital design to protect patients against the hundreds of aerial hazards that float, unchallenged by any mechanical device, from the communicable disease ward, from the out-patient waiting room, from the shoes, clothing and respiratory tract of visitors, into operating theatres, delivery rooms and nursery.

In a good white room in industry, personnel must enter an air-lock. Here an inter-lock entrance door must be closed before the door leading into the white room can be opened. Tightly woven clothing is then donned which leaves only the bare minimum of face skin exposed. Even shoes are removed and replaced by sterile cloth bootees.

Air showers then blast off any dust particles from the clothing before entering the white room proper.

The white room is cleaned by a special vacuum cleaner which does not push almost as much submicron dirt back into room air as it removes from surfaces. Too many of our hospital vacuum cleaners are wonderful sprays of sub-micron dust that would have been better left on surfaces.

The white room is sealed, held under slight positive pressure and kept cleaner by far than most hospital operating theatres.

Air is supplied to the white room after having been first pre-filtered by a relatively coarse filter, then fine-filtered through a costly filter that removes up to 99 per cent of sub-micron particles, which would also include most bacteria. Careful arrangements are made so filters can be changed without recontaminating the airstream. Utmost thoroughness is exercised in maintenance of the entire air handling system, which is kept scrupulously clean.

How many hospital administrators have the staff, the money or the knowledge to keep their critical areas as clean as white rooms?

We call for inclusion in the consulting engineering fee a sum for frequent checks of hospital mechanical system maintenance for at least two years following completion, both to educate hospital personnel and to insure good maintenance for future years.

We call for air-locks or similar mechanical devices on hospital laundry chutes, stairwells, elevators and duct shafts, so descending laundry and elevators won't push, piston-like, large quantities of contaminated air from floor to floor.

We suggest air-locks between sensitive areas like surgery, delivery and nursery rooms, with the same protective steps used in white rooms previously described. The same elaborate air filtration, distribution, temperature and humidity controlled conditions for these sensitive areas should be used, as are installed for industrial super-clean white rooms.

Air could be continuously monitored, despite the complexity of aerobiological techniques, as a check on these mechanical protective devices. The four or five good particle counting and monitoring methods now used for white rooms should be adaptable to hospital use. These safeguards should automatically sound an alarm if a Typhoid Mary type walked near a hospital critical area, for instance.

Remember, a door leak three feet wide and one-half inch high is to a bacteria what a passage 1000 miles wide and 14 miles high is to a man!

The cooperation of medical, hospital, architectural and engineering experts is urgently needed to design hospitals where people can go to get well, safe in the knowledge that they cannot possibly acquire new ills from the hospital environment. ▲▲

Eugene A. Sloane

Editor

Meetings, Courses, Expositions

National Frozen Food Distributors Assn., *Chicago, Nov. 6-10, 1961.*

Air-Conditioning and Refrigeration Institute (annual meeting), *The Homestead, Hot Springs, Virginia, Nov. 12-15, 1961.*

National Warm Air Heating and Air Conditioning Assn. (annual convention), *La Salle Hotel, Chicago, Nov. 13-16, 1961.*

National Electrical Manufacturers Assn. (annual meeting), *Traymore Hotel, Atlantic City, New Jersey, Nov. 13-17, 1961.*

28th Exposition of Chemical Industries, *New York Coliseum, New York City, Nov. 27-Dec. 1, 1961.*

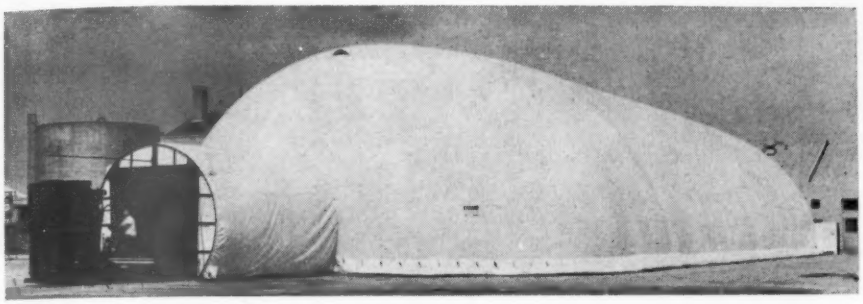
National Assn. of Home Builders, *Exposition Center, Chicago, Dec. 3-7.*

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., *Chase-Park Plaza Hotel, St. Louis, Mo., Jan. 28-31, 1962.*

Air-Conditioning and Refrigeration Wholesalers, *Los Angeles, Calif., Feb. 9-11, 1962.*

12th Exposition of the Air-Conditioning, Heating and Refrigeration Industry, *Great Western Exhibit Center, Los Angeles, Feb. 12-15.*

NEWS of the Industry



New Market Opens For Blowers

Air-supported structures . . . plastic buildings supported by air pressure supplied by a blower . . . are finding use as warehouses, temporary shelters, circus tents, even as white rooms.

We predict increased use of these structures because they are easy to ship, quick to erect, sturdy, easy to take down, occupy little space when stored and cost far less than any other temporary structure.

B. F. Goodrich has two such buildings on the west coast, as shown in the photo, in which 60,000 passenger car tires are stored. Each structure contains 226,195 cu. ft., provides 10,027 cu. ft. of floor space. Support comes from a 30-in. blower holding ½ in. psi. Automatically activated gasoline engine provides auxiliary power for blower.

Structure material is 6¼ oz. nylon coated with Geon vinyl resin.

$$$$ For Air Pollution Control

Instruments for monitoring and analyzing pollutants in six California cities have been purchased by the U.S. Public Health Service from Beckman Instruments, to the tune of $276,000.

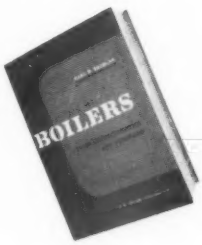
For cleaning discharge from oxygen lance conversions on open hearths at Republic Steel's Chicago plant, electrostatic precipitators costing $3.5-million will be installed, according to Harold C. Lumb, vice president, Republic Steel.

$30,000 yearly lead reclamation is reported by Southeastern Lead Co., Tampa, Fla., from lead captured in orlon bags in their new baghouse at their secondary lead smelting plant. Gas temperature is reduced to 250°F, before entering

(Please turn to following page)

NOW

the only up-to-date reference work about boilers of all types in all applications for heat and power.



This new volume is the first up-to-date comprehensive source of engineering information on boiler selection, operation, and maintenance. Until now this valuable material was simply unavailable, or could be obtained only in fragments.

If you must Specify, Sell, Buy, Install, Operate, Maintain, or Inspect boilers of any kind in any application, you'll find this book an indispensable tool.

PARTIAL CONTENTS

Boiler Types
Steel Firetube
Steel Watertube
Steel Shell
Cast-Iron
Positive Circulation
Thermal Liquid Heaters, Vaporizers
Marine Boilers
Waste Heat Boilers
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[For more information circle #17 on page 35 reply cards]

NEWS of the Industry...

(Continued from preceding page)

bags by a cooling tower operation.

New gas-fired incinerator at Lionel Corp., Hillside, N. J., to burn lardboard, wood, plastic, wet waste and other combustibles without smoke, is expected to pay for itself in savings due to elimination of having to cart refuse away, and through reclamation of metal scrap residue burned clean of all combustibles. Incinerator burns 3000 lbs of waste an hour, is used four hours daily, will be used 8 hours when plant is expanded, according to Joseph Corvasce, plant engineer.

For gas scrubbing on oxygen steel-making furnaces, a venturi gas scrubber system has been installed at Dominion Foundries and Steel, Ltd., Hamilton, Ont., Can. System was designed by Chemical Construction Corp., N.Y.C. New design feature is an automatically controlled damper in throat of scrubber which permits operation at maximum gas cleaning efficiency up to 180,000 cfm.

Practical Methods For Heat Recovery

The importance of heat recovery in industry was discussed during an open forum at the recent ASHRAE meeting in Denver, Colorado. Recommended methods for practical means of heat recovery and conservation were:

"For Air Conditioning and Cooling Installations:

"1. Improve the building design. Insulate, vapor proof, reduce infiltration, and reduce glass areas.

"2. Improve process and equipment design to reduce heat release. Insulate hot equipment and piping.

"3. Recirculate air whenever possible. Filter and purify as necessary, and where permitted.

"4. Reduce makeup air requirements by careful design of hoods and other equipment requiring air. Bring uncooled air directly to the hoods and processes requiring makeup air. Use air from adjoining cooled spaces for makeup. Downgrade the air.

"5. Keep the outside air to the systems to the minimum. Shut down when possible.

"For Heating and Makeup Air Tempering:

"1. Reduce the makeup air requirements by careful design of hoods and other equipment requiring air. Whenever possible, bring in raw air directly to the hoods or process requiring the air.

"2. Mix the supply air with hot building air.

"3. Pass the supply air through a heat exchanger to recover process equipment, or engine heat. Exchangers may be hot air to air, hot gas to air, or hot liquid to air.

"4. Heat the air by cooling process or other equipment.

"5. Recirculate air whenever possible. Filter and purify where practical and where permitted. Downgrade the air—use from adjacent areas whenever possible.

"6. Keep the supply air and the supply air temperatures to the minimum.

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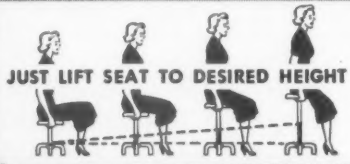

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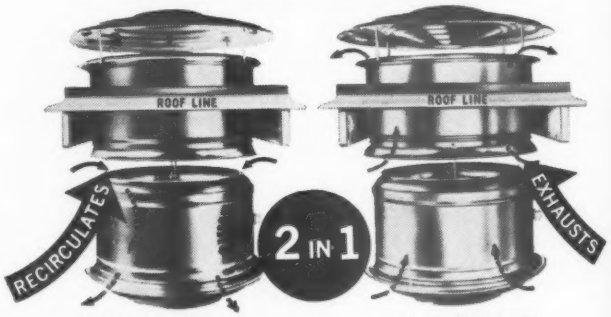

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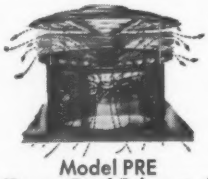

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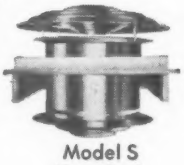

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[For more information circle #19 on page 35 reply cards]

OFFICERS OF The American Association For Contamination Control met with military personnel in Chicago. Standing, L. to R.: Directors Marvin Pratt and Harold Hamilton; E. A. Sloane, secretary; Directors Robert Avery, Richard Cadle, John Barhite, J. Mason Pilcher, Carl Schmid, and Vice President Alvin Lieberman. Seated: Irving Kodel, vice president; Earl Bodem, USAF, and James Mildon, president.

AACC Meeting On USAF Clean Room Tech Order

An animated discussion of the pioneering and controversial Air Force Technical Order on Design and Operation of Clean Rooms, was the highlight of a one-day session on contamination control Sept. 15 at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Feature of the session was a presentation on the development and future plans for Technical Order T.O. 00-25-203, by its author Mr. Earle Bodem of USAF Logistics Command Headquarters, Wright Patterson Air Force Base, MCMPR, Dayton, Ohio.

Mr. Bodem stated that while the manual was originally intended as a guide for Air Force suppliers, its use is being extended to the Army, Navy and National Aeronautics and Space Administration.

Citing confusion among manufacturers on basic criteria, Mr. Bodem called for standardization of all phases of contamination control nomenclature and methods.

He said that the Technical Order first arose as an expressed need by his own agency in the design and operation of clean rooms used in Air Force maintenance. At the present time the Air Force operates 2.3-million sq. ft. of "gray" rooms and 319,000 sq. ft. of Class I clean rooms, according to Mr. Bodem. By 1963, he said, the Air Force will own an additional ¾-million sq. ft. of floor space devoted to various conditions of clean rooms from Class I to ultra-clean Class IV.

A round-table question-and-answer session between Mr. Bodem and other government and private industry representatives on specific white room problems followed his presentation on T.O. 00-25-203.

Industry representatives pointed out that T.O. 00-25-203 was being incorporated into government contracts, despite Mr. Bodem's assurance that its purpose was to serve as a pioneering effort to put together available knowledge in one manual on contamination control for advisory purposes only.

He promised to serve as mediator between industry and governmental contractual enforcement agencies in interpreting the technical order for specific contamination control applications.

(Please turn to following page)

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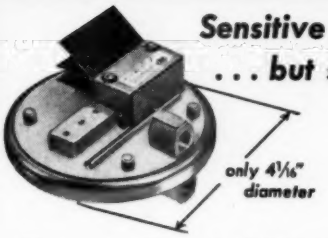

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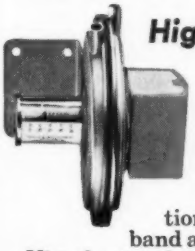

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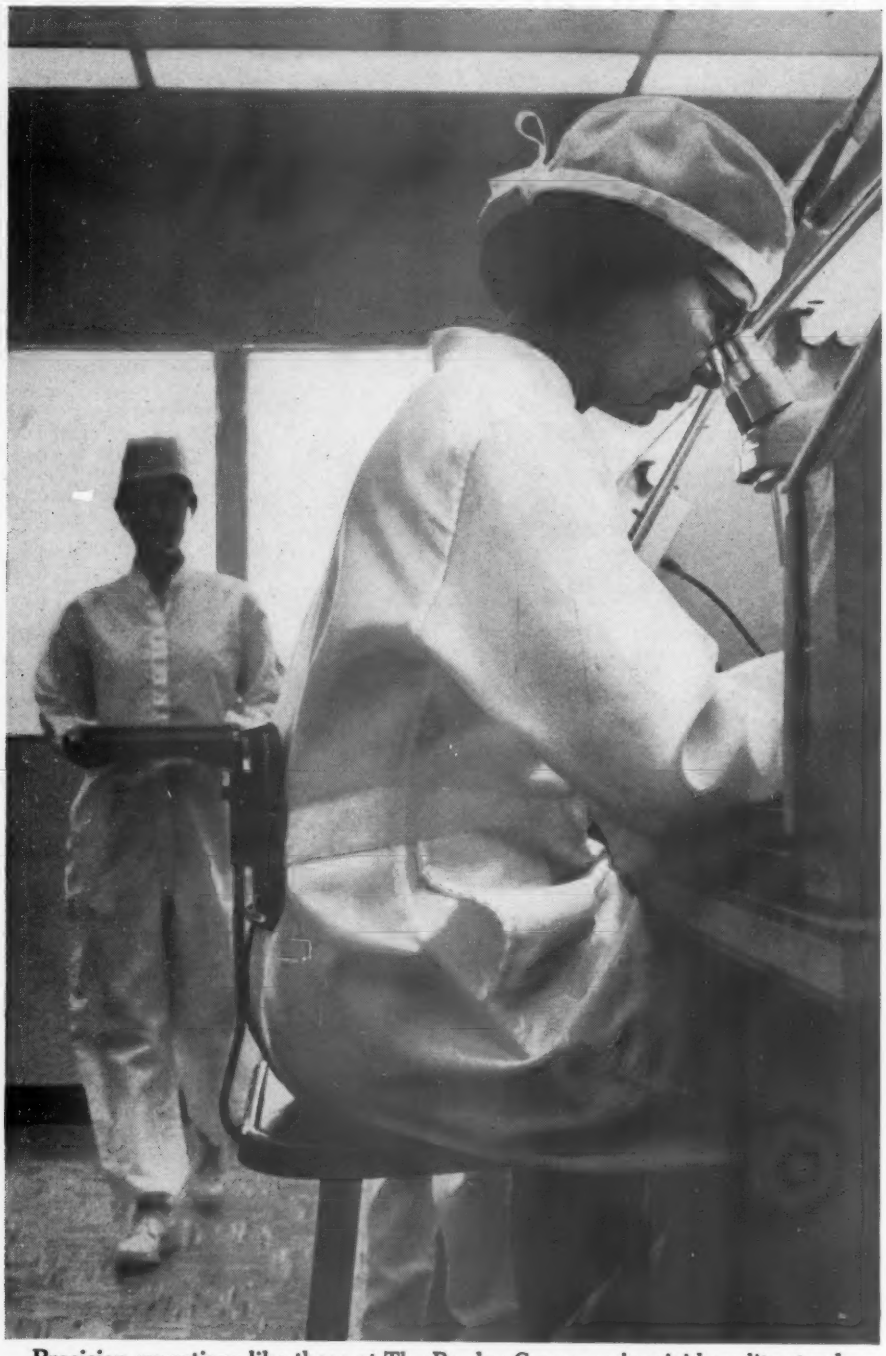
[Circle #20 on page 35]



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[For more information circle #21 on page 35 reply cards]

NEWS

(Continued from preceding page)

The meeting was attended by some 52 representatives from private industry, the Air Force, Navy, National Aeronautics and Space Administration, Army and U. S. Bureau of Standards. It was generally agreed by all attending that contamination control design criteria had to consider the needs of the product involved, and that it is difficult to set standards that will apply to all products.

For example, the Technical Order calls for temperature, and humidity sensing and recording equipment to be centrally located in critical clean rooms. It was pointed out that this equipment itself is a source of contamination and that only the sensing elements should be in the area, with controls and recorders outside.

Humidity Control

Need for 40 percent R. H. ±5 percent in critical clean rooms required by T.O. 00-25-203 was questioned by industry engineers present, who declared need for higher humidities in some cases to control static electricity, and lower in other cases to prevent rust on highly machined surfaces.

Other subjects covered included personnel training and clothing, air filtration, particle counting and monitoring, particle count tolerance, vacuum cleaning of clean room, parts cleaning ultrasonically, personnel cleaning rooms, utilities, fixtures and finishes.

The meeting was moderated by AACC president James Mildon, corporate plant engineer, Lear, Inc., and AACC executive secretary Eugene Sloane, editor, AIR ENGINEERING.

All of the discussion, including Mr. Bodem's presentation, was tape recorded. Transcript can be purchased by AACC members for $5.00, by non-members for $7.50, from the American Association For Contamination Control, P.O. Box 774, Detroit 31, Mich.

To receive information on any of the New Products, circle the item reference number on the postage-free reply cards on page 35, Communications Center.

News of the Industry . . .

(Continued from preceding page)

New Air Diffusion Council Is Formed

A new trade association in the air distribution field, the Air Diffusion Council has been incorporated under the laws of the State of Illinois.

Members of the association manufacture grilles, registers, ceiling diffusers, air flow control equipment and terminal air control devices. One of the prime objectives of the new group is to develop an industry-wide testing and rating standard for use by industry, government, architects, engineers, heating contractors and building contractors.

Officers elected at the first meeting, to serve during 1961-62, are: R. D. Tutt, Tuttle and Bailey, president; P. F. Canavan, Connor Engineering, vice-president; D. Titus, Titus Manufacturing, secretary; and C. T. Roff, Anemostat Corp. of America, treasurer.

For more information write: Air Diffusion Council, 333 N. Michigan Ave., Chicago 1.

More Tax Relief . . .

Last month we reported that Ohio passed a bill through their House of Representatives to provide tax exemptions for air pollution control equipment. Now Oregon is toying with the idea. Their S.B. 530 would exempt from assessment for ad valorem taxes, equipment and structures installed by industries to reduce air and water pollution, so long as these devices do not return a profit to the industries.

Already having laws designed to provide tax incentives for air pollution equipment installation are the states of New Hampshire, North Caroline, Virginia and Wisconsin.

Air Pollution Warning System

Officials from both New York and New Jersey have recommended establishment of a New York City metropolitan area warning system to deal with incidents of high air pollution.

Such an incident occurred in Nov., 1953, and a study just completed by Dr. Leonard Greenburg (formerly Director, Air Pollution Control Department, N.Y.C., now at Yeshiva University, Albert Einstein College of Medicine), revealed that a huge stagnant air mass of polluted air collected from industrial regions of Ohio, Pennsylvania, New York, and New England and New York City, drifted over the city and caused about 30 deaths.

Warning system presumably would alert the populace on impending incidence of future such accumulations of polluted air, though what the residents in the affected area could do about protecting themselves against this pollution was not mentioned.

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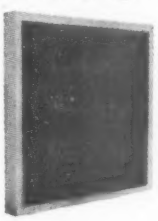

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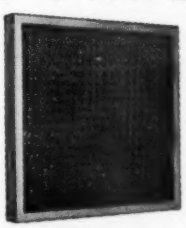

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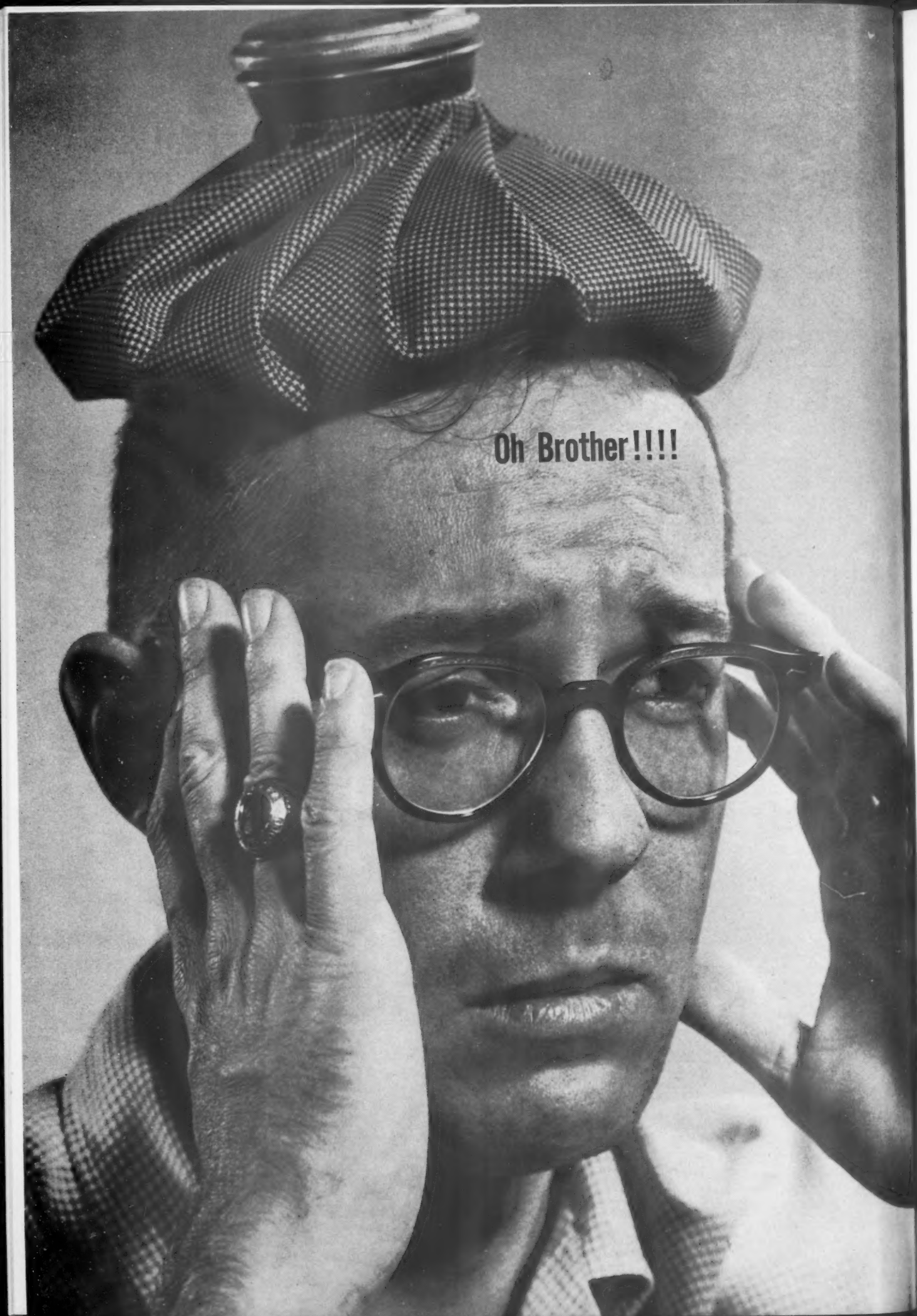
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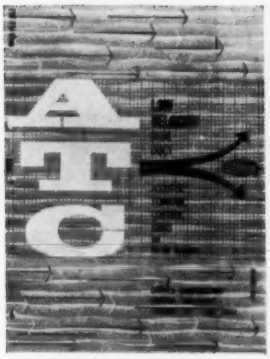

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A less costly fan, smaller horsepower motor and reduced electrical power can force the same quantity of air through larger low-velocity ductwork, when space limits do not demand smaller high-velocity ducts. Less system noise reduces acoustical control components. Low-velocity cuts installation cost, ductwork need not be leakproof . . . slight leakage is often desirable, thus sealing and welding of seams and joints are eliminated. Fittings need not be so precisely made; lighter gauge material is approved. System static-pressure unbalance is controlled by conventional methods . . . constant volume devices in each unit not required.

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More zones are permitted by dual-duct system . . . hot and cold mains or branches can be tapped off to a terminal control unit at each specified space. Same amount of available ductwork space accommodates a greater number of zones.

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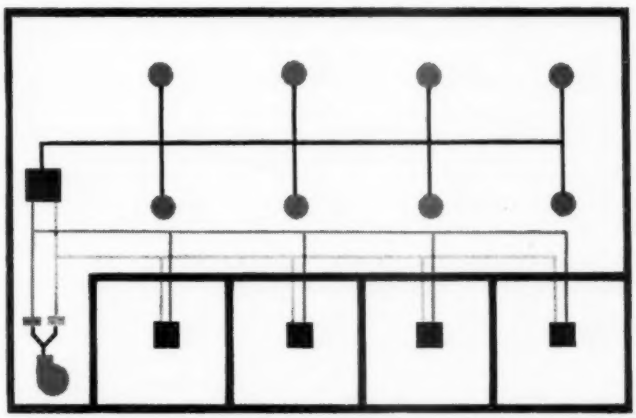
Temperature of supply air — in a reheat system — must be maintained to satisfy the room with the greatest cooling load; reheat coils require year-round steam or hot water. In a low-velocity dual-duct system, the hot coils need not be operated during the cooling season — tempering is done by outside and recirculated air. Also, coils are centrally rather than separately located, cleaning and maintenance are thus simplified, and the dual-duct system can also respond more quickly to load change.



Private offices in this small office building are provided with individual low-velocity ATC units. The general office area is supplied by one large low-velocity ATC unit.

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[For more information circle #23 on page 35 reply cards]

How Modern Manufacturing Methods Affect Ventilation

When production processes change or production itself increases, drastic changes often need to be made to the ventilation system. Here are a few of the more important things to consider, based on a case history.

by John Soet*
Director, Div. Of Occupational Health
Michigan Department of Health

A FEW years ago a lead contamination outbreak occurred in a plant that casts and machines about 3000 to 4000 lbs of 20-30 percent lead bearing bronze per day.

Major exhaust installations were made to control lead fumes and to maintain lead concentrations below the toxic limit. Since that time, a sharp increase in production made the original installation obsolete and stop-gap methods had aggravated the toxic condition. Fifty percent of the employees had high lead absorption and were under a physician's care. At this time steps were taken to resolve the situation on a permanent basis.

A preliminary survey of the foundry brought out several interesting facts:

¶ Housekeeping was excellent and would tend to deceive as to the air contamination that existed. Usually, the physical appearance of the plant is a tip-off on the effectiveness of the ventilation system. In this case, however, the opposite was true.

¶ Ventilation control measures were not consistent. While we found excellent control at some operations, other operations had no control at all.

Fig. 1 shows a plan view of the foundry layout and the exhaust system at the time of our first study and before any changes were made. I shall describe the operations in this foundry in the same manner as the metal progresses through the plant and explain the exhaust ventilation facilities at each operation as I proceed.

At the top of Fig. 1 is shown the smelter room, in which three tilt furnaces are located along the west wall. These furnaces had individual circular hoods with ducts running up and joining at center of roof, at the roof fan. This fan was not in operation and the thermal lift from the heat of the furnaces provided the only air movement through these hoods and ducts to the outside.

In this same smelter room, the two furnaces located in the east wall (Fig. 1) are used for preheating of crucibles only and as far as lead-in-air is concerned, they are of very little interest.

After metal is smelted in tilt furnaces it is poured into crucibles and moved down or south into the next room by means of a monorail to the ingot pouring operation. This ingot operation was hooded with ducts running up to a roof fan. The ventilation con-

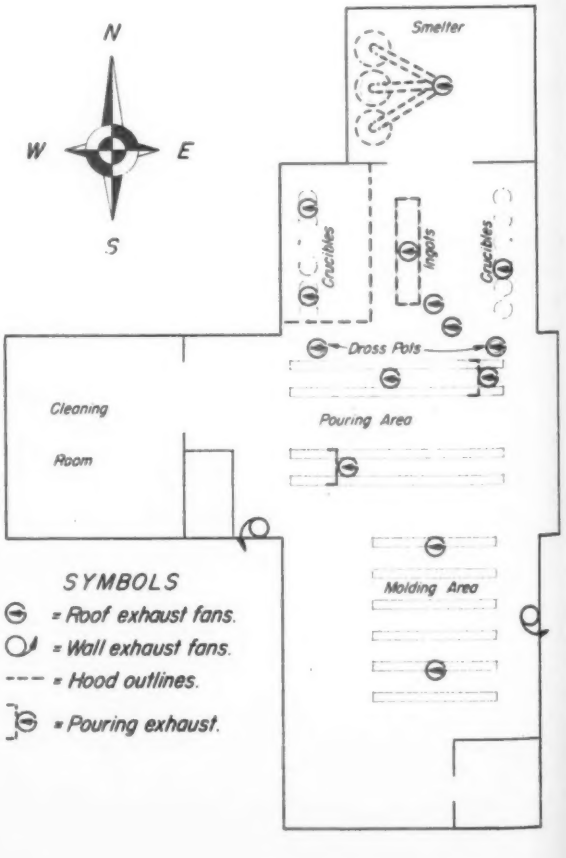

Fig. 1: Situation in the smelter room that caused lead poisoning among employees.

**Mr. Soet has been associated with the Michigan Department of Health in the Occupational Health Division for the past 23 years. He holds a B.S. and M.S. in chemical engineering and is a registered professional engineer in both Michigan and Ohio.*

trol at this operation was acceptable to us.

After cooling, ingots are removed from molds, placed in crucibles and crucibles then lowered into furnaces shown just to the left and to the right of the ingot pouring operation, Fig. 1.

The bank of crucible furnaces on the west wall was hooded by means of metal drop curtains in the rectangular shape shown by the broken line in Fig. 1.

These curtains came to within about 12 ft. of the floor. This curtained area was exhausted by two roof fans—shown in Fig. 1 by heavy circles with arrows pointed to center.

After the metal is heated to pouring temperature in the crucible furnaces, it is moved down or south on monorails to one of two drossing stations—labeled "dross pots" in Fig. 1—in the pouring area. Note that the one drossing station is just south of the west bank of crucibles and the other is located just south of the east bank of crucible furnaces. The dross is removed from the heated metal at these stations.

Drossing Hoods

These drossing stations were hooded in a rather unusual manner as shown in Fig. 1. The ducts from these hoods ran directly up to the roof fans. Our tests showed that these drossing operations were well controlled when the hoods were properly used.

After the dross is removed from the hot metal, it is conveyed by monorail to one of the two pouring stations shown in Fig. 1. All the molds are made up in the molding area and roller conveyed to these two pouring stations. The two pouring stations are located just south of the east drossing station and the other somewhat further south from the west pouring station. These pouring stations were hooded by means of sidedraft hoods as shown in the drawing. The exhaust ventilation at these hoods was sufficient to do a good control job.

After the castings are removed from the molds, they are conveyed to the cleaning room shown directly left or west of the pouring area.

It is important to note provisions made for general ventilation in this foundry. There were two general roof fans in the molding area. A general wall fan was located along the east wall in the molding area and another wall fan was installed in the south wall of the cleaning room just as you enter the room. Another general roof fan had been installed between and just south of the two drossing pots. We also found two general roof fans between the drossing pots and the ingot operation.

All these general roof and wall fans were misguided attempts to provide general ventilation. We found that these general exhaust fans contributed to widespread contamination because they created air disturbances carrying metallic fumes to all areas of the foundry.

Our first step in the solution of the lead problem in this foundry was to take air samples throughout the whole plant. We did this for two reasons:

¶ It gave us definite information on the extent or magnitude of the contamination and the location of the contaminating areas, and . . .
¶ It gave us a reference line to which we could refer in later air analyses.

Fig. 2, line 1, shows the analytical results on these first air samples. Lead concentrations are plotted along vertical axis on this graph. The horizontal axis shows locations at which lead samples were taken, running from the smelter room through the cleaning room and proceeding in the manner in which bearing metal progresses through the plant.

You will note from Fig. 2, line 1, that the melting area in the furnace crucible room had the highest concentration of lead. At one point it ran as high as 10 milligrams per cubic meter. The next highest concentration (line 1) we found in the molding area which ran higher than 5 milligrams per cubic meter. The third highest concentration (line 1) we found in the smelter area with a high of about 3 milligrams per cubic meter.

The maximum allowable concentration for lead is shown by the heavy broken line which is just above the horizontal axis and labeled M.A.C.—maximum allowable concentration—on each end

(Please turn to following page)

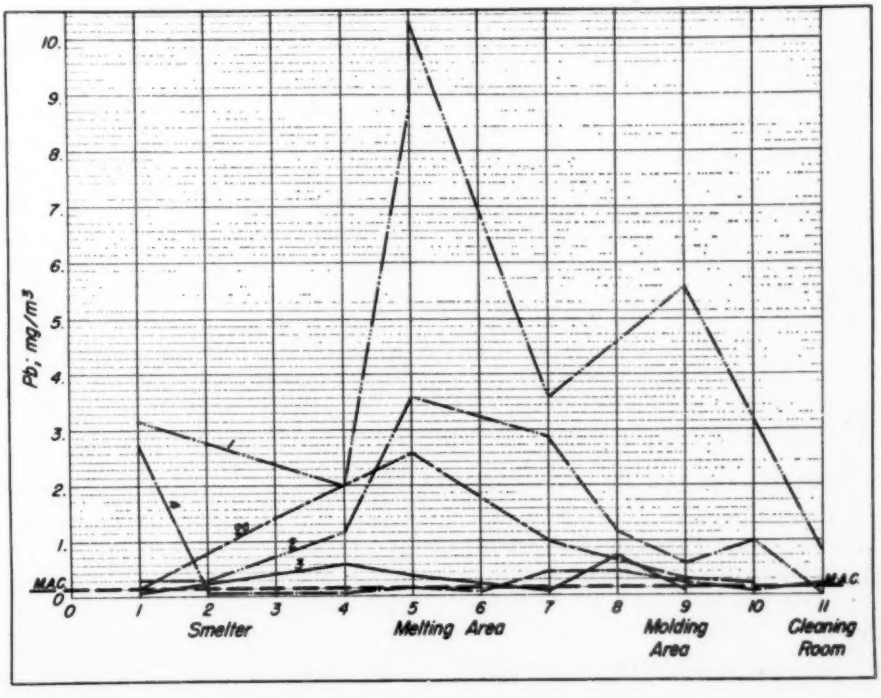

Fig. 2: Line one shows results of first air samples. Note high concentration in melting area in furnace crucible room. Text explains later air samplings shown by other lines in this drawing, marking reduced contamination as result of ventilation system changes.

(Continued from preceding page)

of the line. You will note that the analysis on all the samples showed that the lead concentrations were far above the maximum allowable limit. Our objective, therefore, was to bring the concentration of lead in air at all the operations throughout the whole foundry down to that heavy broken line—the M.A.C. line.

From these analytical results we took our first steps in positive ventilation control. Fig. 3 gives a visual picture of the recommendations we made. In the smelter room we placed a hood around the whole west bank of 3 smelters; this was done by simply dropping a curtain from wall to wall from the north wall in the smelter room to the south wall, and the fan that was originally in the center of the smelter room was moved into a position directly above the furnaces. There was no necessity for ducts since the curtain extended up to the roof.

Curtained Furnaces

We also recommended the installation of sheet metal curtains to act as a hood around the east bank of crucible furnaces as shown by the broken line around these furnaces. For more effective exhaust capacity, the general exhaust wall fan which was located in the molding area was moved into position underneath the hood of these east bank crucible furnaces.

At the west bank of crucibles we added additional fan capacity by removing the wall fan formerly located in the cleaning room to a point in the wall under the hood at the west bank of crucibles. You will note that we also had three general exhaust fans removed, one near the ingot operation and the two in the molding area.

In relocating these general exhaust fans and removing the others, we achieved a two-fold purpose:

¶ We increased the amount of air exhausted at the operations needing additional fan capacity, and

¶ We eliminated the unsatisfactory existing general ventilation measures.

In order to determine what effect these new changes and alterations made on the concentration of lead in air, we took another series of air samples at the same locations as those used in our first air study. You will note from Fig. 2, line 2, that we made a considerable general reduction in the lead concentrations in air. Our recommendations had telling effect in the smelter area (line 2) and in the molding area (line 2). There was a substantial reduction (line 2) also in the melting area. While we took a substantial bite in the distance we had to travel down to the maximum allowable limit or the M.A.C. line, we still had a considerable distance to go, especially in the melting and molding area.

Further Refinements

We, therefore, turned our attention to further refinements in the ventilation control measures. As pointed out before, the metal curtains around the west and east bank crucible furnaces were installed to extend down from the roof to within about 12 ft. of the floor. We now recommended that these curtains be extended to within 6½ ft. of the floor. To determine what effect this downward extension of the hoods on the metal curtains had on the lead in the air concentrations, we took another series of air samples with the results shown in Fig. 2 by line 2-a. You will note that in general our lead concentrations moved farther down towards the M.A.C. line and that we were cutting into that last increment needed to reach the line.

At this stage, we were convinced that leakage was occurring from furnace hoods through openings provided for the monorails and that a solid baffle or skirt as shown in Fig. 4 across the southernmost end of the furnace area would be of value. This baffle did not disturb their operation procedures and handling methods. It separated the drossing and pouring operations from the furnace area.

We are under the impression that the installation of this baffle would bring us in close to the finish line so we took another series of air samples, but while we were taking these air samples we opened doors and windows to

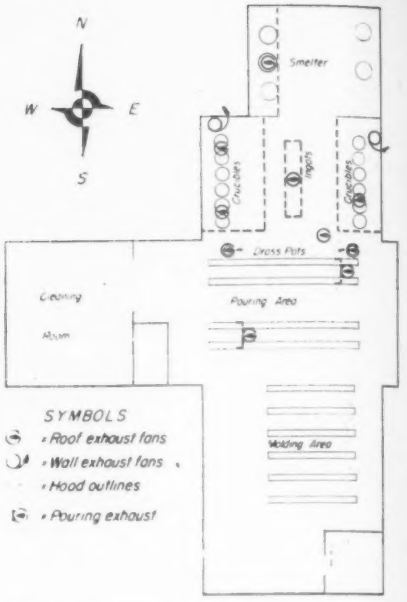

Fig. 3: Hood around west bank of three smelters in smelter room cut lead content of plant air.

simulate air make-up facilities to see what effect this would have on our results. We had been suspicious from the first that not enough air was being introduced into the building to satisfy demands of exhaust fans.

Results of these air samples are shown in Fig. 2 on line 3. We had, as you can see, considerable success. We were right in on the M.A.C. line and almost parallel to it.

During the summer months, we formulated plans to provide tempered outside air to the plant. We decided that about 15,000 cfm of tempered air should be supplied in the extreme south end of the foundry as shown in Fig. 5. The balance of the make-up air was allowed to enter the smelter and furnace room in the northern end of the building along the north and east walls as shown by the long broken arrows in the smelter room.

During the cold weather of 1951, the tempered air supply system was installed and operating, and in November, we took our last series of air samples. The results of this study are shown in Fig. 2 on line 4. The one high sample in the smelter room was due to poor handling technique but you will note that the line paralleled and

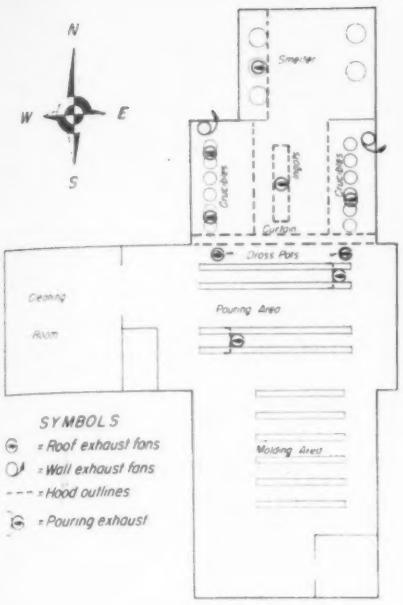

Fig. 4: Baffle across south end of furnace area cut lead contamination of air still further.

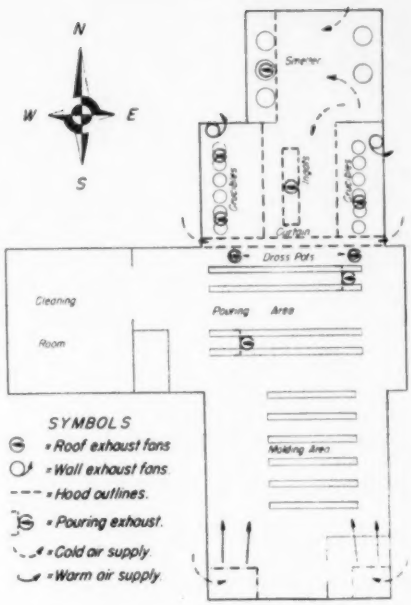

Fig. 5: Make-up air introduced toward south wall gave flow of uncontaminated air over most workers.

almost coincided with the M.A.C. line. After four major steps and groups of recommendations, we had crossed the finish line and hit our objective.

One of the interesting sidelights to the air supply problem should be mentioned. A bid was submitted for the installation of a commercial dry-type, electrostatic precipitator for recirculation of exhaust gases from the furnaces with an assured collection efficiency of 90 percent. In order to satisfy ourselves that a 90 percent collection efficiency would reduce lead concentration in air below the maximum allowable limit, we took air samples of effluent gases from the furnaces and we found that average concentration of lead fume in the effluent was 4.5 milligrams per cubic meter of air. It was evident that 90 percent removal would still leave the air far above the maximum allowable limit and the proposal was abandoned.

We originally considered the whole foundry in terms of one complete air movement system, because the exhaust system at one operation cannot be isolated from the exhaust system at another. When we work with air movement in open areas, air movement at one operation affects the air movement throughout the whole area. It is rarely possible to calculate industrial exhaust systems on the basis of local or isolated problems. It is a matter of integrating all the air movement factors in one open area into one effective exhaust system.

Orginally there was no segregation of operations in this fountry. It was only after we found that it would be advantageous to set up two completely separate systems that we placed a barrier from wall to wall and segregated the furnace operations from all other areas in the building. The reason we suggested the erection of this barrier is of immediate interest. The thermal lift and the sudden expansion of air created by the heat from the furnaces in the crucible and smelter room disturbed the whole airflow pattern in the foundry. We set up the barrier to prevent this disturbance from affecting our exhaust and airflow patterns in the molding and pouring areas.

Air Supply Important

Another point that our illustration showed was the importance of air supply. As soon as we introduced sufficient make-up air into this building, we had a marked decrease of lead in air—in other words, we did a better control job without adding to or altering the exhaust system. It is absolutely necessary to introduce as much air into a building or area as the amount of air taken out. This point may appear self-evident but unfortunately we find that many elaborate and expensive exhaust systems are not working effectively because of insufficient make-up air.

An obvious reason for not bringing in sufficient air is due to the cost of tempering or heating make-up air in the colder months. Based on a 40-hour week operation, 50 dollars worth of heated air is exhausted out of the building with each 1000 cfm discharged. This, without a doubt, is a serious item to consider when you exhaust thousands of cubic feet of air, but with few exceptions, it is one of those things you can't avoid. By exceptions, I mean recirculation or using heat generated by some process.

Recirculation of air by means of a collector can be used to avoid cost of heating outside make-up air; however, as demonstrated, collector systems for toxic materials are rarely efficient and dependable enough to remove the toxic contaminants to the point where recirculated air can be used safely. This explains our attitude on recirculation of air from collectors designed to remove toxic materials. We have no objection to using efficient collector systems on non-toxic materials.

Tempered Make-up Air Limit

This brings up another reason for erection of the barrier. The barrier was an effective means for limiting the amount of tempered make-up air. The heating unit at the south end of the foundry tempered only that amount of air demanded by the exhaust fans in the pouring area plus that required to insure a flow under the baffle to the melting area. We took advantage of the radiant heat emanating from the furnaces to heat the necessary make-up air for the furnace and smelter rooms. This reduced the cost of heating make-up air by more than 50 percent.

Another point of interest was our selection of the entry locations of make-up air. As shown in Fig.

(Please turn to page 41)

How to Design Hot Air Door Curtains

Design of hot air door blanketing systems using direct-fired gas heating equipment . . . with data on air delivery temperature, volume, velocity and direction of air flow.

by Lowell F. Crouse,
Vice President,
Maxon Premix Burner Co.

Fig. 1: Hot air door curtain blankets door of this auto assembly plant. Heating equipment is in penthouse above vestibule.

HEAT losses through loading dock doors and other such outside openings are a huge drain on the space heating system. Cold wintry winds blowing through open doors create uncomfortable working conditions over large adjacent areas.

A properly-designed hot air door curtain will virtually eliminate these losses for the main heating system and restore comfort to the work areas.

Direct-firing with gas provides the most efficient transfer of heat energy to air in motion, eliminating heat exchangers and coils. Dilution of the products of combustion in the air volume being heated keeps those products well within the range of allowable concentration.

The air delivery temperature, volume, and velocity and the method of directing the heat into or across the opening will depend upon a variety of individual considerations, as outlined below.

Nature of Area Into Which Door Opens

For doors on semi-enclosed loading docks, for doors with vestibules, for doors to warehouse areas, and for other such openings not leading directly into manufacturing space, a simple and inexpensive heater may be used, as shown in Fig. 3.

The heater is located overhead a short distance back from the door opening. Fresh air is taken in through a duct from outside the building, heated, then directly blasted at the opening to meet the incoming cold air.

More elaborate layouts involving the installation of distribution ductwork will usually be required when people are working near the door. Such arrangements are illustrated in Figs. 4 and 5. The heater is located where air from outside may be drawn in conveniently, heated, then delivered through a duct system to discharge slots along the sides or top of the door opening.

Prevailing Outside Conditions

Outdoor climate has a great deal to do with the amount of heat required and the volume and velocity of air handled. In cold climates the problem is much more severe than in mild areas. On the side of the building exposed to the prevailing winds, greater care must be exercised in selecting, sizing and locating equipment.

Size And Type Of Door

A small door is easier to blanket than a large one. Higher velocities and sometimes higher delivery temperatures are required as the size of opening increases.

Doors eight to twelve feet in height that are wider than they are high usually may be covered by a slot across the top, as shown in Fig. 4. Openings that are higher than wide may be covered to better advantage by discharge slots along the sides, as illustrated in Fig. 5.

For extremely large doors, it may be best to provide a hot air curtain from the top for the upper half of the opening and from both sides for the lower half.

Whether door is of the sliding type, roll-up, or overhead type will have a bearing on heater location and duct arrangement. A sliding door, for example, is better-suited for a discharge duct along the top; while an overhead door opening is more easily reached by vertical ducts along the sides.

Frequency Of Use Of Door

If the door is used infrequently, the application may be very simple and the automatic controls may

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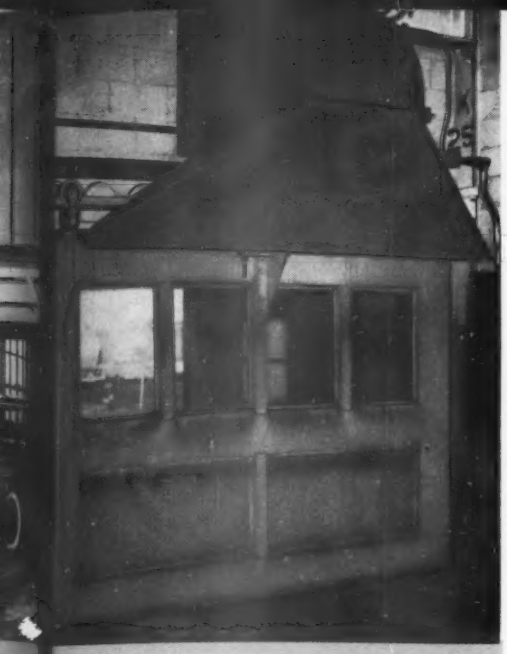


Fig. 2: Inside view of same door, showing how air is blasted downward across the door opening from door-width slot.

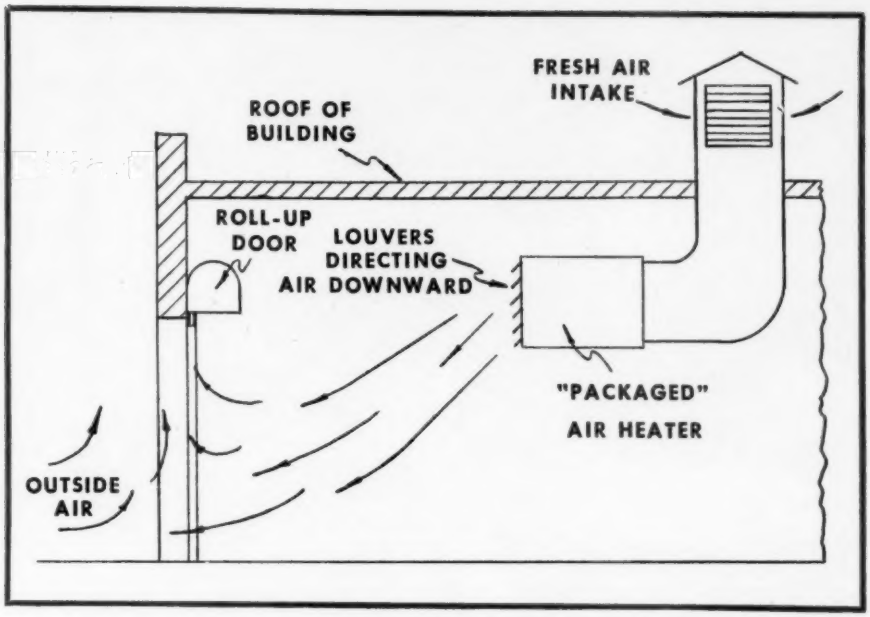


Fig. 3: A simple, direct air-blast application of a direct-fired gas packaged air heater. Using 100 percent outside air, air is blasted downward through directional louvered outlet to cover opened doorway.

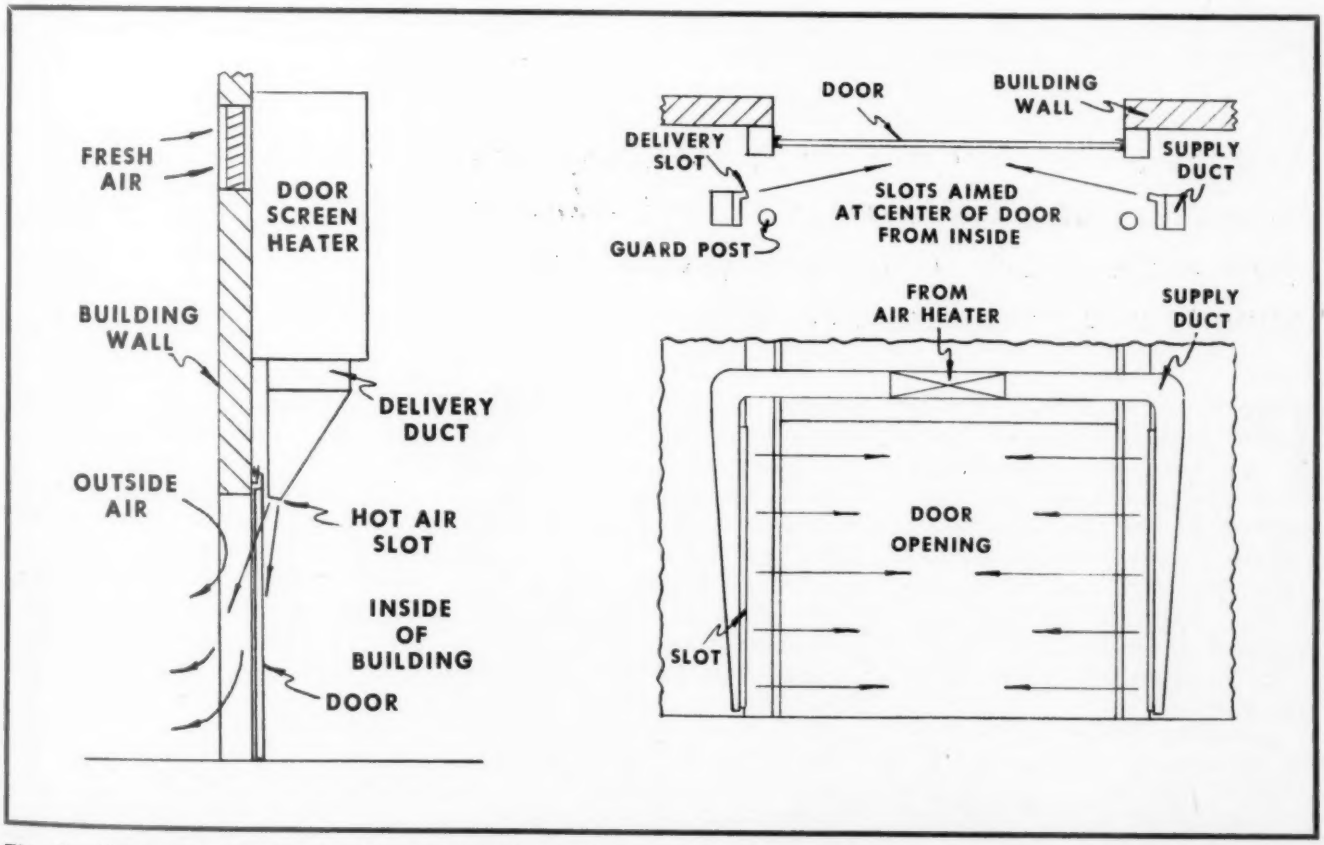


Fig. 4: Air curtain application for door heating, using a slot for delivery of hot air down across the door opening, directly from equipment above the door.

Fig. 5: Openings that are wider than they are high may be blanketed with hot air from the sides of the door opening for improved coverage.

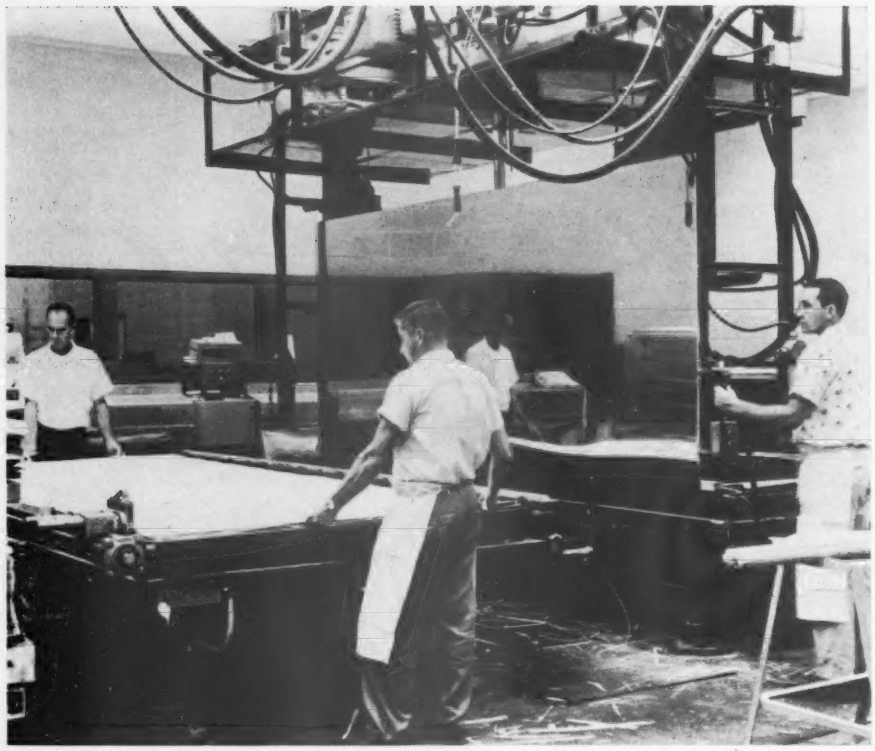


Fig. 1: Formica's build-up room where Kathabar humidity conditioning prevents moisture and dirt damage to sheets of decorative laminate, in process and after finishing. Tables are used to build up layers of impregnated paper; polished steel sheet on top of each pack, for glossy finish, accompanies material to press for curing. Humidity is held at 25 percent or less during the build-up process.

Formica Finds

Process Air Control

Pays Off Three Ways

Reduction of overall production costs, prevention of slowdown in winter weather, improved product quality are results Formica found in accurate humidity control.

by Albert V. Trepkus
Power plant engineer
Formica Corporation,
Subsidiary of
American Cyanamid Co.

PROCESS CONTROL in our production of Formica decorative laminates depends upon many factors—raw materials, precision application of resins, heat, pressure. But no one factor is more potentially critical than the atmosphere in which the materials are processed—particularly in terms of the humidity in the plant during certain operations.

Controlling this by a chemical dehumidification system we installed in 1960 has reduced overall production costs, prevented slowdown in humid weather, and improved product quality.

Formica is a laminated plastic material made of layers of paper impregnated with synthetic resins. The base or core of the standard sheet consists of seven layers of kraft paper, each separately treated with resin before lamination. On top of the core goes the decorative sheet of paper which has been printed with one of 85 different designs in one or more colors, and this is finally topped by a translucent sheet impregnated with melamine resin which makes it perfectly transparent.

In the process of manufacturing a Formica laminate, the nine layers are assembled in a "pack" with a polished stainless-steel plate on top of the transparent sheet. This pack is then subjected to heat and pressure. Hydraulic presses cure the raw materials at temperatures over 300°, with pressure of about 1500 psi, for approximately one hour. The mirror-finished steel plate gives the finished sheet a high gloss. After curing is completed, the sheet is trimmed to size and the back of it is sanded; it is then ready for storage awaiting shipment to a customer.

The build-up room—where the pack is prepared for the press—and the adjacent storage area for sheets in process and finished

(Please turn to page 26)

DUSTEX CORPORATION
P. O. Box 2520 Buffalo 25, N. Y.
Sales Representatives in Principal U. S. Cities

DUSTEX COLLECTORS FOR HIGHER PRODUCT RECOVERY...GREATER DUST NUISANCE ELIMINATION

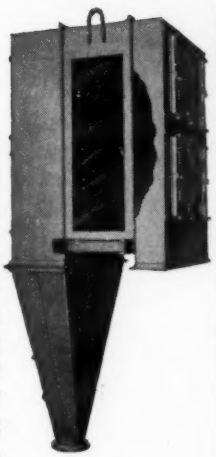
. . . with self-cleaning action and continuous, low-cost, maintenance-free operation

In Centrifugal Collection . . .
EXCLUSIVE DUSTEX PATENTED DESIGN MAKES THE DIFFERENCE

- Dustex collectors have proven successful on many process dust problems where other mechanical collectors have failed.
- Unobstructed inlet plenum avoids material buildup and plugging.
- All tubes are surrounded by cleaned gases and maintained at system temperature to forestall condensation and plugging when systems are above dew point.

DUSTEX CONTROLLED VORTEX CYCLONES

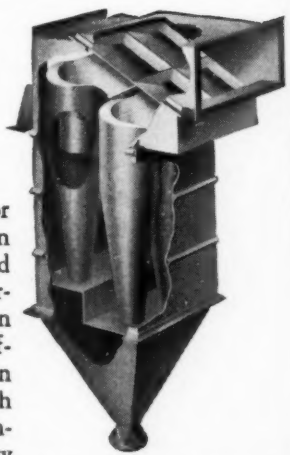
handle most collection problems



Both the D-584 and D-560 Collectors meet varying requirements as to fines recovered. The Dustex D-584, with its lower pressure drop and efficiency rating of 100% at 14 microns on standard fine air filter test dust, is highly satisfactory for many applications. The Dustex D-560, on the other hand, with a rating of 100% at 12 microns, could effect important additional product recovery savings where the value of fines being lost is exceptionally high. Both collectors, of course, separate out high percentages of particles well under the sizes at which their ratings are 100%.

DUSTEX "1600"

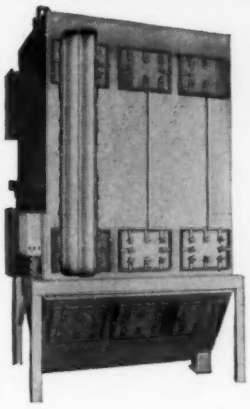
for many ordinary dusts superior Dustex performance in lower price range



The Dustex "1600" dust collector employs the same patented design as the other Dustex Controlled Vortex Cyclone Collectors, assuring identical self-cleaning action and trouble-free operation. It differs from the D-584 and D-560 in the larger diameter tubes which reduce the collector's cost substantially while effecting its efficiency only slightly. This type is recommended only where ultra-high efficiencies are not required. 100% efficiency at 20 microns means many ordinary dusts can be recovered or eliminated while saving considerable investment for the buyer.

Write for your FREE copy...

This concise, illustrated booklet describes the Dustex Single Tube Determination Test in detail. Write for your free copy and information on any Dustex Collector without obligation.



DUSTEX "INDUCTAIRE" FILTER COLLECTOR

doubles air/cloth ratios... lowers initial investment and maintenance costs

- Superior cleaning action
- Dampers in clean air ducts only — no other moving parts
- Longer filter life
- Maintains system volume within narrow limits

Dustex "Inductaire" introduces an entirely new concept to the reverse air principle. After the usual reverse air cleaning cycle has begun, collapsing the filter tube, the "Inductaire" nozzle in the bag cap releases short pulses of air inducing additional air currents from the top on down, gently flexing and opening the bag through its entire length, and purging the dust cake downward into the hopper. This overcomes the problem of trapped dust which results when tube collapses. The more thorough cleaning action makes possible air/cloth ratios of 5 cubic feet/square foot or more, drastically reducing space requirements and the corresponding initial investment. Accomplished without violent, fabric-damaging mechanisms, "Inductaire" cleaning greatly prolongs fabric life. This, along with less frequent bag changes and easy installation further reduces general maintenance and operating costs. "Inductaire" collectors, equipped with suitable fabrics for handling varieties of dust problems, are available in sizes and combinations of units to meet any capacity requirements.

***DUSTEX VACUUM VALVE** for all hopper and bin discharges (under negative pressure)*

- Positive Sealing
- No Moving Parts to Wear or Leak
- Maintenance Free
- Just Bolt in Place and Forget It

DUSTEX DETERMINATION TEST

shows you results before you buy

Dustex Single Tube Determination Test, performed on your job site, under actual operating conditions, will show you the exact equipment required before you spend one penny for installation costs or the collector itself. Prior to the development of the Dustex Test Method, it was necessary to select the type of equipment first without any opportunity for testing actual performance. Now a Dustex engineer can provide the correct answer to your dust problem in just a few hours time.

P. O. Box 2520 • BUFFALO 25, NEW YORK

The company with the big name in dust collection

[For more information circle #24 on page 35 reply cards]

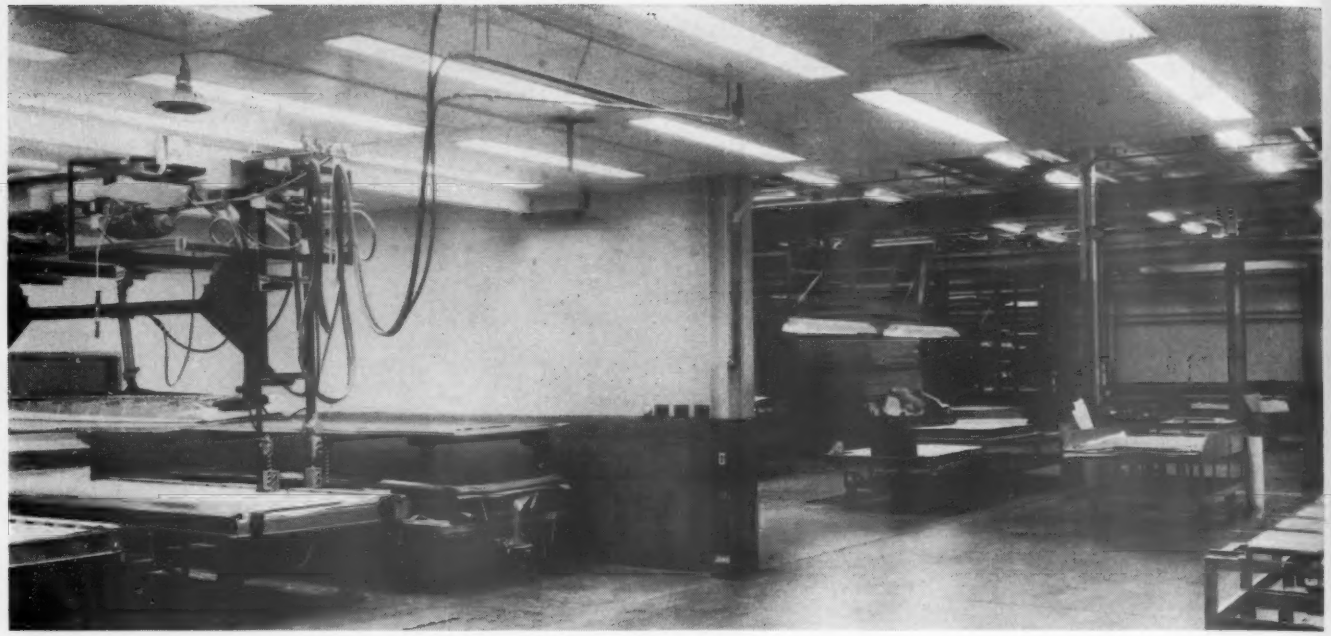


Fig. 2: View of "build-up room," at left, where packs of impregnated sheets are assembled in preparation for the press. Storage area is shown in the background.

Process Air At Formica

(Continued from page 24)

laminates—are critical areas so far as humidity is concerned. The filler treating room, where translucent sheets are impregnated, also requires close humidity control. These are the areas where we recently installed humidity control systems to improve our ability to hold proper conditions.

The build-up and storage rooms normally require about 25 percent relative humidity as a maximum, while the filled treating room calls for about 28 percent maximum. The present systems make such control easy under all kinds of weather conditions, for the first time in our experience. Previous methods, such as alumina desiccant dehumidification, did not prove adequate without excessively large equipment installations.

In a very humid atmosphere, the Formica sheets will tend to curl and fracture. Moisture spots or dirt (also removed by our present system) would mar the finished product. And high humidity presented a danger of finger marks on the transparent top sheet. All of these conditions are averted by proper control of humidity, and the savings in scrap alone more than pay the cost of the equipment.

The humidity control system is based upon the ability of a chemical solution, lithium chloride, to absorb large quantities of moisture from the air—the quantity closely predictable in terms of the temperature and density of the solution. Much like a shaker of table salt in humid weather, the lithium chloride takes on moisture from the surrounding air—then releases it when heated. By harnessing this process in a simple mechanical installation, the system can control humidity at any desired level, within very close tolerances.

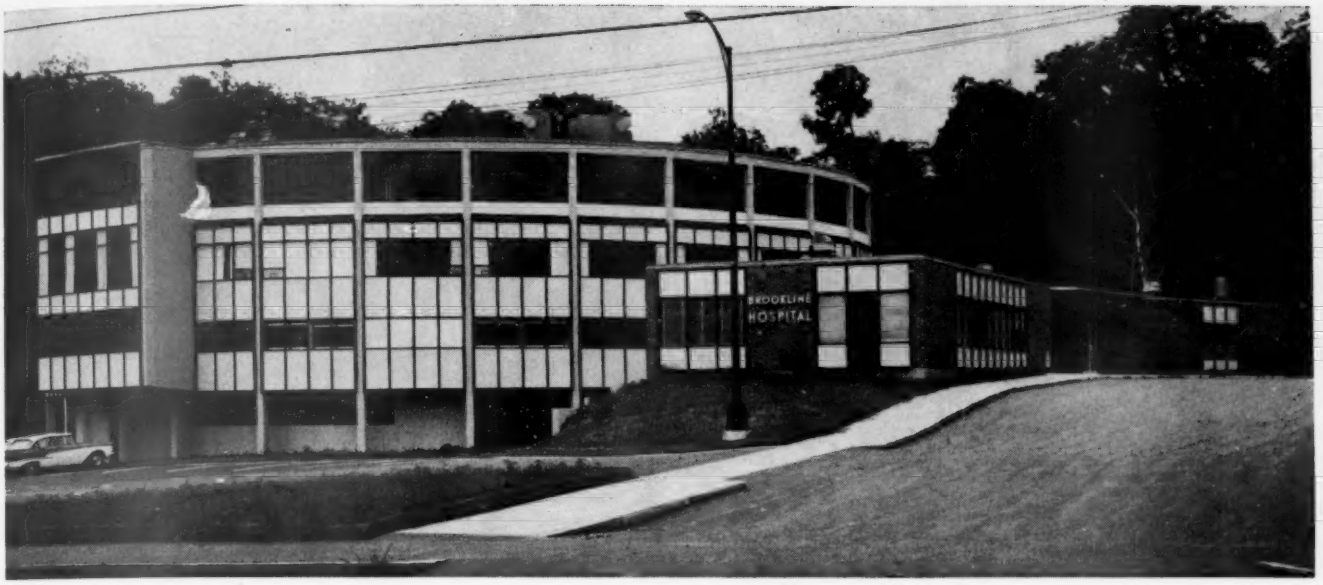
The larger of our two conditioning systems, which serves the build-up room and storage area, handles 17,500 cfm of air. About 75 percent of that volume is return air from the conditioned space, while the remainder is air taken from the outside. The two air sources lead into the conditioner unit, where the air is passed over cooling coils and subjected to a spray of the lithium chloride solution.

Ultimately, of course, this solution will become saturated with moisture. To remove this moisture, we use a regenerator unit tied in with the air-washer. The regenerator contains steam coils which heat the solution which passes through it, forcing the lithium chloride to yield its moisture. The dry solution then returns by gravity to the pumping unit, which is between the conditioner and the regenerator, connecting the two.

Amount of moisture removed from the air depends upon solution temperature, controlled by coolant in conditioner coils; and upon its concentration, which is regulated by the rate of regeneration. Our coolant is artesian-well water which is fairly constant within a degree or two of 60°F the year round. Concentration of the solution at any given time—directly related to its water content—will affect its depth in the pumping unit, and when it reaches a prescribed level, the regenerator action is set in motion to remove water. Thus, by setting this control to maintain the desired density for any conditioning need, we can accurately control the rate of dehumidification.

Conditioned air leaving the humidity control system is carried by ducts to the build-up room and the storage area where impregnated sheets and finished products are stored. In addition to removing moisture, our system also takes from the air a variety of contaminants picked up in the processing area. The solution constantly passes through a filtering unit which removes solid impurities picked up from the air in the conditioner. We have an additional benefit, in maintaining a healthful atmosphere for our employees,

(Please turn to page 43)



The Case For Professional Balancing Of Big Building

Air Distribution Systems

Complicated air distribution systems call for careful attention to balancing methods. Here are reasons why this job should be done by pros for best results.

by William N. Jacobs, Jr.,
Treasurer, Wm. Nelson Jacobs Associates, Inc.,
Architects — Engineers

THE balancing and testing of modern air conditioning systems is a job for professional engineering specialists—*not* the construction crew. Yet it is still practice to assign this critical task to heating contractor personnel or the like. Skilled craftsmen they are; trained engineers they are not.

Deficient operation, frequent maintenance, and high operational costs are but a few of the consequences which can result from incompetent balancing and testing. The complexity of a modern air conditioning system literally *demands* the services of professional balancing and testing specialists to achieve design performance. The new Brookline Hospital, Brookline, Mass., is a case in point.

The main hospital structure is circular in design. This building shape was selected because of the construction economies it offered and the functional advantages for hospital activities. Although the floor layouts were somewhat unusual, the shape of the building presented no particular problems for either the design or installation of the air conditioning system.

Design specifications called for the supply of outside air at a rate of 33,000 cfm. Outside air passes through an electronic filter. It is then directed by baffles through separate decks of hot and cold ducts. Main hot and cold air supply ducts run parallel in concentric circles, with radial feeder ducts running to individual blending boxes. Each room is equipped with a separate temperature control. There is no exposed radiation; all diffusers are located in the ceilings. A total of 42 roof fans allow for 100 percent displacement of air.

Routine test operations of the completed system revealed a number of unsatisfactory conditions. Static pressure throughout the system was below design specifications. Temperature fluctuated greatly in critical areas such as operating rooms, nursery, and patient rooms. In general, a state of imbalance prevailed throughout.

Adjustments and corrections attempted by personnel of the various subcontractors had little effect on the condition of the system. The decision was made to call in the Leonhardt Company of Brookline,

(Please turn to page 40)

[For more information about the advertisement on pages 28 and 29, circle #25 on page 35]→

SURSE

O

SIGN

of CLEAN-AIR ENGINEERING

Despite 80 dust-producing operations, air is clean enough to be recirculated

Brown Shoe Company's new Steelville, Missouri plant is filled with a variety of dust-producing operations. But in spite of all the grinding, trimming, pounding, pressing, roughing and polishing it takes to manufacture heels for quality shoes (such as *Life Stride, Buster Brown* and *Roblee),* the air in this big plant is clean enough to be recirculated. The reason: AAF's AMERjet.

Dust-laden air from all of the operations is drawn into a single AMERjet collector just outside the building. Here, the dust and air are separated; the dust goes into the AMERjet hopper (at the rate of 185 cu. ft. per 8-hour day) and the clean air is returned to the plant. The savings: lower heating costs with minimum boiler capacity, lower plant-cleaning costs, higher worker efficiency.

AAF's AMERjet will handle heavy dust loadings of materials of varying nature with a constant pressure drop that assures accurate control. Maybe it could mean big savings for your company. For complete information on the AMERjet, call your nearby AAF representative. Or, write direct for Bulletin 279. Address: Robert Moore, American Air Filter Company, 305 Central Avenue, Louisville, Kentucky. In Canada: American Air Filter of Canada, Ltd., 400 Stinson Blvd., Montreal 9, Quebec.

AAF **American Air Filter**

BETTER AIR IS OUR BUSINESS

Process dust from many different shoe-manufacturing operations is trapped as quickly as it's produced at Brown Shoe Company's Steelville, Missouri plant. AAF's AMERjet reverse jet fabric collector settles the dust in its hoppers, returns only clean air to the modern, windowless plant.

Industrial Heat And Its Control

Part IV

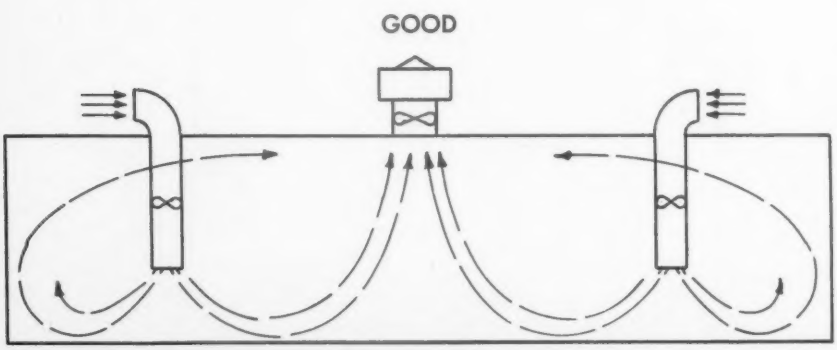
Part IV, the final article in a series about relieving heat stress from hot working areas discusses solutions involving both mechanical and evaporative air conditioning.

by Robert C. Lemke*
Industrial Hygiene Engineer, Michigan Dept. of Health

PART I COVERED theory of heat gain, benefits of heat stress relief and instrumentation. Part II took up methods of determining degree of heat stress and selection of methods for relieving industrial heat stress. Part III discussed the mechanical means of keeping personnel cool.

Evaporative Cooling

General ventilation and supply air ventilation are effective for cooling only as long as the outdoor air temperatures are low enough to offer inside relief. Evaporative cooling is a method of lowering the outdoor dry bulb temperature and can be used effectively in many hot industries. It is essentially a process in which air with high dry bulb temperatures from outside can be passed through water sprays and reduced in temperature to almost the water temperature. In Michigan, with an average summer dry bulb temperature of 90°F, and wet bulb temperature of 75°F, the air is reduced to 75-80°F, depending upon evaporative cooler design. This simple, inexpensive procedure can lower temperature of the outdoor air from 10-15°F. Since the dry bulb air temperature cannot be lowered below the existing wet bulb temperature, the wet bulb air temperature for a given locality limits the effectiveness of an evaporative cooling system. Therefore, careful consideration should be given to the wet bulb levels for the particular geographical location in question.



Buildings over 400 ft. wide, the air is brought to the 8 ft. level.

To Avoid Raising Relative Humidity

Where evaporative cooling systems would not be practical for general comfort cooling of large areas, they can still be effective when used in hot industries for spot cooling and cooling of larger hot process areas. Evaporative cooling needs to be used in conjunction with exhaust ventilation to avoid raising the relative humidity of the entire area.

**Mr. Lemke is a graduate mechanical engineer and a member of the American Conference of Governmental Industrial Hygienists.*

Bartlet R. Small lists in a reprint from "The Iron and Steel Engineer" the following four simple precautions to be observed when selecting evaporative cooling systems.

1. Use all outside air and never recirculate in hot weather.

2. Maintain adequate air motion around the men who are to be benefited. Though not scientifically developed, a minimum air velocity of 300 feet per minute ranging to 1,000 feet per minute under severe heat conditions has been found successful. Adequately equipped air dampers that permit 80 percent velocity turndown are essential, thereby extending the system's usefulness to spring, fall, and often winter, if room air is to be recirculated during these seasons.

3. Provide a split system whereby evaporative cooling is used in combination with motorized roof exhaust ventilators and sufficient fresh air inlet openings. In this way the two to five-fold greater volume of raw, outside air holds down the overall temperature level in all areas of an obviously hot operation and sweeps out the spent washed air.

4. Avoid application of evaporative cooling to offices and areas free of hot operations except in recognized hot, dry climates of which the southwest is typical.

Station Isolation

Isolation of a crane cab, rolling mill operator's platform, or other operations where small work or control stations are located in a large hot area is a lot more practical than attempting to lower the temperature of the entire area. Cooling of such a station is accomplished by enclosing the work station and providing the enclosure with conditioned or cooled air.

Air Conditioning

Air conditioning, which is control of temperature, humidity, and air movement, finds its greatest acceptance in offices and large areas where there is little process heat to add to the overall heat load and air can be recirculated. There are, however, an increasing number of manufacturing areas using air conditioning especially in the manufacturing of precision equipment, and where it is necessary to obtain control over humidity to prevent rust.

Summary

Excessive heat has physiological effects on workers, and a comfortable working atmosphere is

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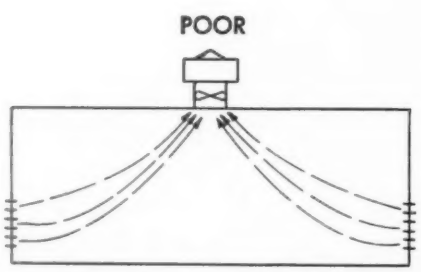
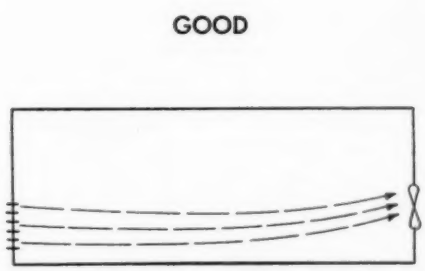
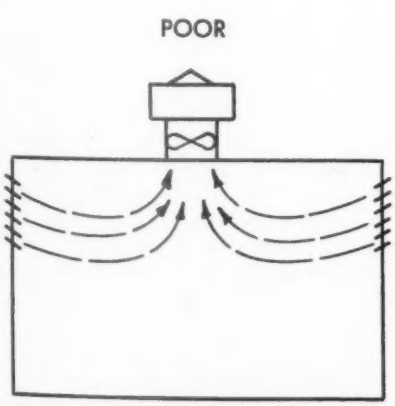
COOLING BY GENERAL VENTILATION



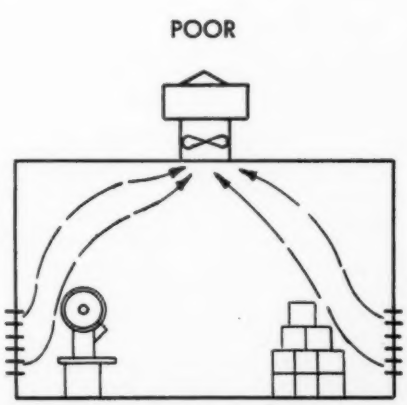
Working area not affected by air movement because of building width.



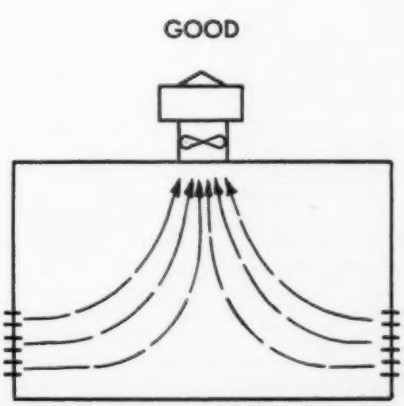
Air movement sweeps the entire length of lower level of the building.



Inlet air flows completely over the working area.

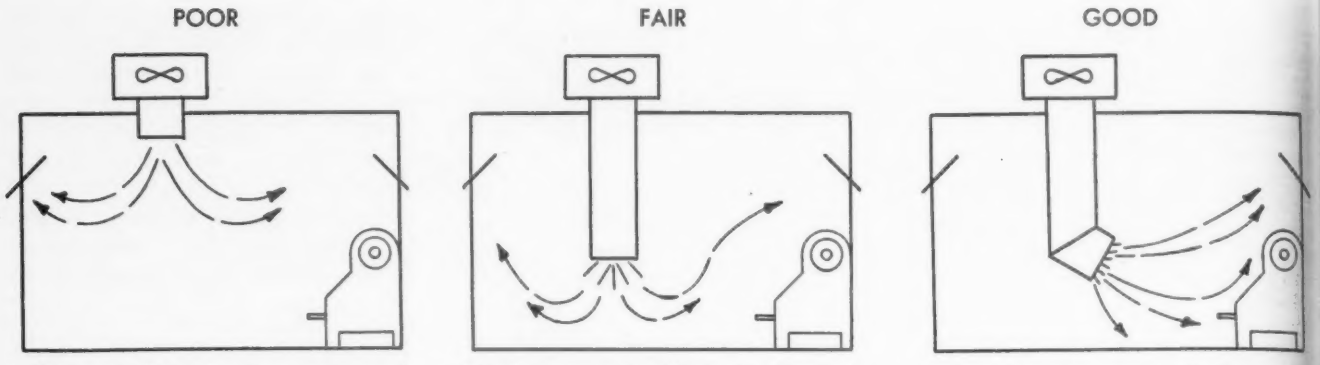


Flow of inlet air blocked by the positioning of equipment.



Inlet air sweeps through the working area more effectively.

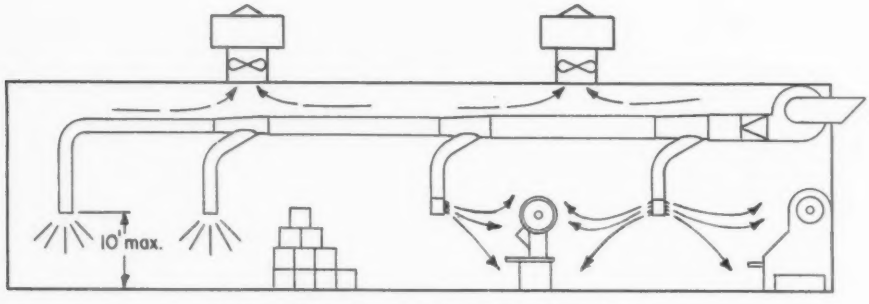
INTRODUCTION OF OUTDOOR AIR THROUGH DUCT SYSTEM



Outdoor cooling air does not reach the personnel working level.

Worker can not adjust air stream to suit personal requirements.

Adjustable air supply allows worker to adjust air stream.



Air distribution system for spot cooling.

(Continued from preceding page)

recognized as a good investment. Understanding of each individual heat problem as to the physical factors that contribute to its make-up and its severity is essential if effective measures for heat abatement are to be provided. ▲▲

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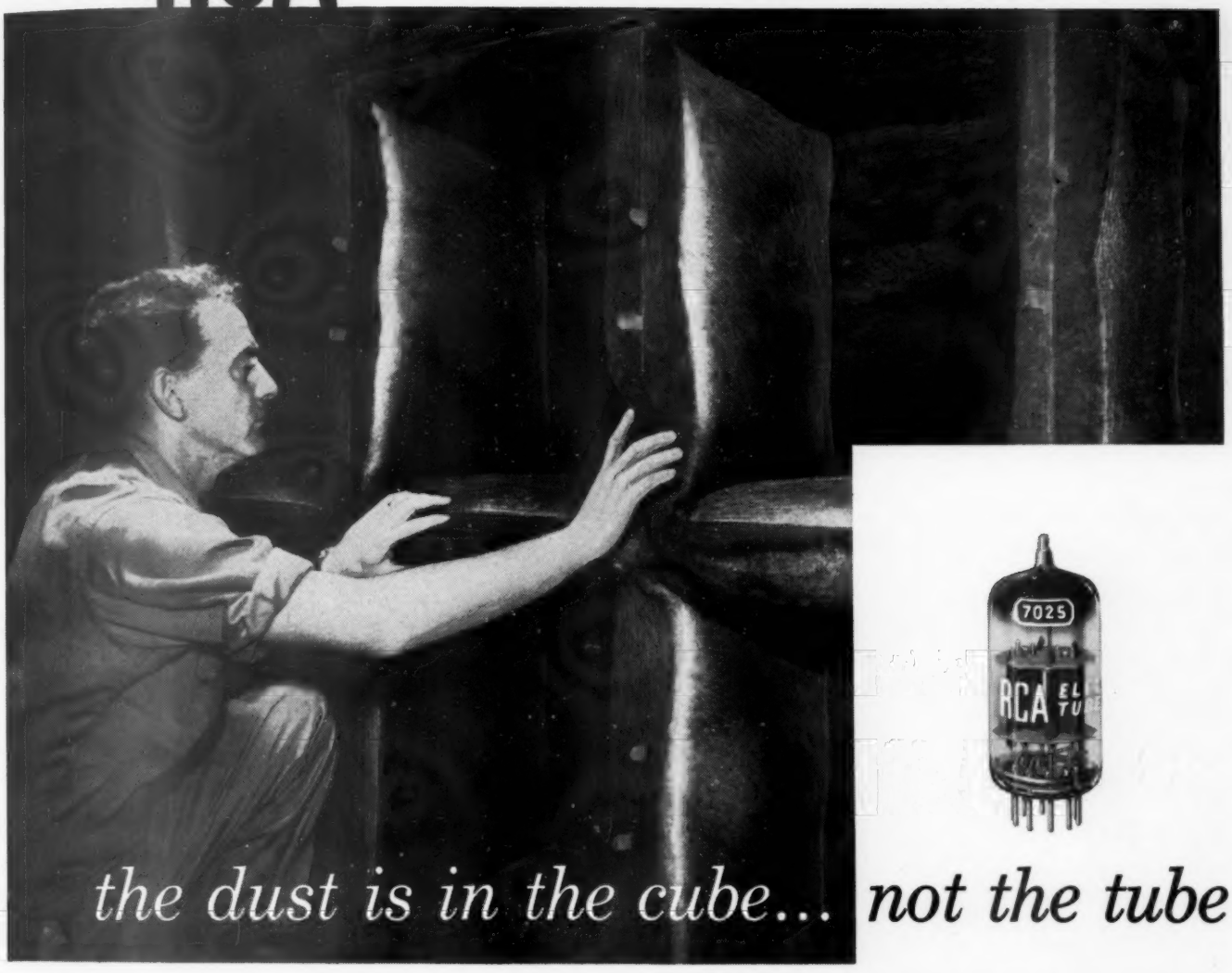
at RCA



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Air clean enough to breathe could contaminate a miniature vacuum tube. For maximum filtering efficiency a pre-filter precedes an electrostatic precipitator at RCA's electron tube plant in Harrison, N. J. Recently, an increased heat load required an increase in the velocity of air—from 600 ft. to 800 ft. per minute—to pass through the pre-filter. This meant changing filters every two weeks. RCA required greater filtering efficiency and longer filter life without a major overhaul of the system, and UNION CARBIDE had the answer!

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New Literature

To receive information on the New Literature, circle the item reference number on the postage-free reply cards on page 35.

Industrial Filter Catalog

Booklet describes and illustrates the lightweight aluminum washable Research Products Corp. industrial air filters. Filters are specifically designed for industrial and commercial use. Complete information on pricing, capacity and available accessories is included in booklet.

Circle #131 on page 35.

"Design Considerations For Make-Up Air Systems"

Reznor Mfg. Co. has published a handbook presenting an analysis of the need for, and the basic steps to follow in designing make-up air systems.

Circle #132 on page 35.

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[Circle #26 on page 35]

"Recent Advances In Heat And Mass Transfer"

A 396-page collection of the more widely used heat and mass transfer papers that would be useful to practicing engineers and researchers. Published by McGraw-Hill Book Co. and priced at $9.75.

Circle #133 on page 35.

Automatic Bag-Type Dust Arresters

Northern Blower Division, Buell Engineering Co., Inc. has issued a new brochure covering automatic bag type dust arresters that collect dust without interruption during bag cleaning.

Circle #134 on page 35.

Unit Air Conditioner

New Nesbitt Roommate II, a year-round air conditioning unit designed for offices, hotels, apartments, hospitals and schools is described in Publication 602-A. Unit has two new features, the Humid-a-Guard control system for introducing outdoor air at the unit without sacrificing comfort or control; and the Air Volume Stabilizer Damper for introduction of outdoor air at unit without danger of unheated or unconditioned air blowing into the room, through the unit.

Circle #135 on page 35.

Facts On Industrial Ventilation

Booklet and case histories on industrial ventilation are available from The Electrical Association of Philadelphia.

Circle #136 on page 35.

Corrosive Fumes Catalog

Industrial Plastics Fabricators, Inc. has published a new catalog describing how to handle corrosive fumes with fans, air washers, and exhaust systems made of PVC. The 36-page booklet includes illustrations, charts, dimension diagrams, and descriptions of each item.

Circle #137 on page 35.

White Room Work Surface Material

Technical Bulletin issued by Fiberesin, gives application data on their solid plastic table tops. Material has no crevices to hold dirt, is said to be ideal for white room table tops. Material is a solid plastic material molded in large flat sheets, impervious to boiling water, acetone, soaps and detergents, grease and many other substances.

Circle #138 on page 35.

Coil Catalog

Dunham-Bush now has available a sales and application booklet covering all its "DX" coils and detailing inherent design, fabrication material, and application of each.

Circle #139 on page 35.

Spectrometer

Details on a cycloidal focusing mass spectrometer, utilizing a cycloid tube with 1.1 in. focal distance and a permanent magnet charged to approximately 4500 gauss, are offered in a bulletin released by the Analytical & Control Div. of Consolidated Electrodynamics Corp.

Circle #140 on page 35.

Sound Measuring

A new brochure from H. H. Scott, Inc.'s Instrument division features their complete line of sound measuring and analyzing instruments, industrial amplifiers, speakers and FM tuners, plus information on multiplex adaptors and test equipment.

Circle #141 on page 35.

New Bulletin On Fans

Construction features, specific components, and capacity tables for the full 12-size line of "HS" Fans are offered in a new 44-page illustrated catalog available from American-Standard Industrial Division.

Circle #142 on page 35.

Make-Up Air Systems

Six basic types of "Sun-Flo" direct gas-fired make-up air units

(Please turn to page 36)

New PRODUCTS

To receive information on any of the New Products, circle the item reference number on the postage-free reply cards on page 35, Communications Center.

Ultrasonic Cleaning Equipment

Purpose: For cleaning precision parts produced or assembled in super-clean or white room areas without exposing them to airborne dust or direct personnel contact. From Branson Instruments, Inc.

Features: Single and double systems for one and two operators. The single system consists of ultrasonic wash tank with special drain fittings and rinse sink housed in stainless steel cabinet. Each tank is equipped with single lever mixing faucet for hot and cold soft water and can also be equipped with spout for hot and cold deionized water.

Working area is fitted with sloping glass window hinged from the top and held with wing screws. Access to the working area is provided by glove ports.

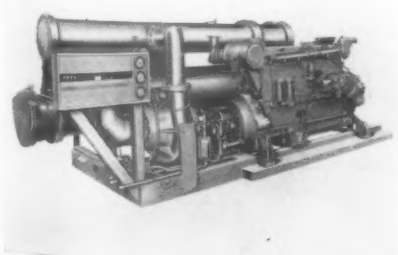
Two air filters for dust removal are fitted at rear of cabinet. Filtered air enters working area through lip at front of cabinet and is exhausted through louvered panel at rear. Rate of flow is 150 ft/min.

Control panel is of etched stainless steel and includes temperature indicator and liquid level control.

Circle #71 on page 35.

Gas Driven Centrifugal Water Chilling Systems

Purpose: From York Corp., Subsidiary of Borg-Warner, a new line of Turbomaster Centrifugal Water Chilling system.



Features: Line is powered by natural gas engines and available completely assembled at the factory, including engine mounting. Company has 29 models with capacities from 90 to 600 tons. Systems also offer automatic prerotation vane control and a safety control system to prevent engine-overload.

Circle #72 on page 35.

New Humidity Control

Purpose: Edwin L. Wiegand Co. has announced the addition of a new sensitive humidity control to its Chromalox temperature control line.

Features: Designated type HC-842, it may be used to operate an exhaust fan which discharges moist air and draws in outside air to replace it.

It has the range of 10 percent to 100 percent with a 4 percent differential. It is rated 125 VA for 115/230 volt a-c and 45 VA for 115 volt d-c.

Circle #73 on page 35.

Industrial Incinerator

Purpose: From Winnen Incinerator Co., for industrial use.

Features: A wide trough around the charging door-opening to catch any loose waste. Counter-balanced one-piece door with wide opening to accept larger crates and cartons. A second butterfly air vent installed in front and above the grates to provide faster combustion and over-fired air.

Circle #74 on page 35.

Air Washer Units Of Rigid PVC

Purpose: To cleanse, humidify, and cool incoming air. From the S & C Mfg. Co.

Features: Except for 10 gauge steel base and stainless steel exterior framework, washers are contructed entirely of PVC. Because of this the units are lightweight and corrosion resistant.

Available in three basic models, units offer cleaning efficiency up to 98 percent and cooling efficiency up to 95 percent of initial wet bulb depression, according to the company.

Circle #75 on page 35.

Portable Ozone Recorder

Purpose: For scientific studies of weather, air pollution, industrial hygiene control, and monitoring ozone test chambers.

Features: According to Mast Development Co., Inc. the unit is compact, lightweight, portable, weather protected, and features remote recording.

Operating range: 0 to 100 pphm/volume. Sensitivity: ±2 percent of full scale. Sampling rate: approximately 140 cc/min. Response time: 75 percent of true value in 1 min. Power requirement: 110 VAC 100 Watts; one 1.34 volt mercury cell.

Circle #76 on page 35.

(Please turn to following page)

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[Circle #27 on page 35]

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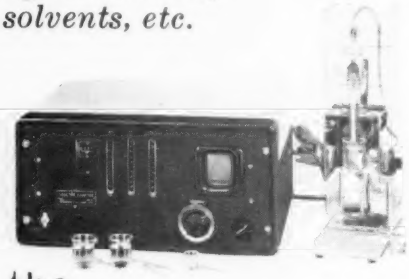

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10.0	541
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1.5	245,000
.9	1,570,000

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[Circle #28 on page 35]

New PRODUCTS

(Continued from preceding page)

Packaged Air Shower

Purpose: May be used as a single unit for small clean rooms, or in multiples for large hallway walk-throughs handling large groups of people at a time. From Agnew-Higgins, Inc. meeting Air Force clean room specification T.O. 00-25-203.

Features: Operating on the re-circulating principle actuated by weight of person on floor grating, the unit does not require outside air supply and according to the company will not bleed down clean room atmosphere.

Operates on choice of 220 1-phase or 220/440 3-phase current. Air is filtered to 0.3 microns at 99.97 percent efficiency, according to Agnew-Higgins. Air blast velocity is 50 fps minimum.

Circle #77 on page 35.

Air Diffuser For Troffers

Purpose: Permits coordination of air distribution and illumination in single ceiling unit. Produced by Anemostat Corp.

Features: The Type CLD diffuser may be used with any brand troffer. Diffuser is of the aspirating type, and discharges supply air at acceptable sound levels without smudging.

Circle #78 on page 35.

Air Re-Circulating Circuit Units

Purpose: Manufactured by Sonic-Air Products and designed for use where any contamination may impair or destroy a product's usefulness.

Features: Two new machines that reduce particle count to a maximum of 10 to 20 particles per cu. ft. and will allow no particle to pass through the filters larger than .3 microns in diameter.

Both machines attain this level of contamination by refiltering the same air in a closed, automatically pressurized cabinet atmosphere.

The "A" Model supplies only enough outside air to maintain static pressure in the system and a triple absolute filter downstream of the twin blowers. The pressurized cabinets prevent aerosol particle "leaks." There are twin return ducts from the work area, and the three-and-one half cubic feet of air moves at 40 ft per/min. Temperature rise is about eight degrees. The entire "A" unit is 24½ x 35 x 11 in.

The "B" model provides a closed, dry nitrogen atmosphere, and activated twin charcoal filters to remove toxic or noxious fumes. Humidity is controlled within .3 of one percent. Temperature regulation is normally plus or minus six degrees, with plus or minus one degree available. Precipitation escapes through an "S" trap. Dew point can be as low as -120°F. Explosion vents are provided for hazardous solvents.

Circle #79 on page 35.

Single Inlet Mixing Box

Purpose: For use in interior zones that demand cooling the year round, from the Barber-Colman Co.

Features: Temperature control in the space is accomplished by providing more or less cooling, with a constant volume of air delivered at all times. On a thermostat demand for less cooling, the amount of cool primary air is reduced, and at the same time secondary air is induced into the primary air stream from a ceiling return plenum.

Circle #80 on page 35.

Annular Impactor Head For Air Sampler

Purpose: For use with portable high volume air sampler FMC by Air Sampler Division of The Staplex Co.

Features: Utilizing a turbine type blower, the complete assembly samples air at approximately 50 cfm equivalent to 454 LF/S per second. Efficiency of 95 percent is obtained for particles above 0.4 microns in diameter having a density greater than 15 GM/CM^3.

Circle #81 on page 35.

Hermetic Compressor Motor Starter

Purpose: According to Westinghouse Electric Corp., the starter requires less voltage and is reduced 25 percent in size.

Features: Starter is a size 6 controller, 90 in. high, 36 in. wide, and 28 in. deep.

Contactors are rated 600 volts, 600 amperes for either front or rear connected and are mounted on steel panel 19¼ in. wide, 13¾ in. high and 8 in. deep.

Circle #82 on page 35.

"Sky-Lite" Pyrojector Unit

Purpose: Venting heat, smoke or shock waves upward through the roof. Manufactured by Swartwout Fabricators, Inc.

Features: Large fiberglas windows. Installed entirely above the roof. Quick release chain for manual operation. Handles permit opening from roof without disturbing release mechanism. When dampers open, snubber chains and springs hold them vertical for maximum draft.

Circle #83 on page 35.

Air Cleaners For White Rooms

Purpose: For industrial, commercial and medical white room application.

Features: According to Research-Cottrell, Inc. electrostatic air cleaners that can remove dust particles with guaranteed efficiencies in excess of 99 percent.

Plate and tube type available in capacities from 100 to 11,000 cfm. Particulate matter is charged and eliminated from the atmosphere in a collecting duct or tube by the attraction of a powerful electrostatic field. The electrical charging capacity of these units is 7 to 17 kv.

Circle #84 on page 35.

Environmental Test Chamber For Aircraft Parts

Purpose: Designed by Cincinnati Sub-Zero Products for temperature, altitude, and humidity testing of aircraft parts.

Features: Environmental extremes in the sixty-four foot stainless steel chamber, 48 in. high x 48 in. wide x 48 in. deep are accomplished as follows: Low to minus 100°F in 2½ hours; High to plus 200°F in one hour; sea level to 100,000 ft. altitude in thirty minutes; and humidity, 20 percent to 95 persent with a dewpoint limitation of 35°F. Accuracy of control is by means of two-pen, two-cam, wet and dry bulb controllers with 12 in. circular charts.

The chamber, with 22½ x 39½ multipane, frost-free window, is equipped with terminals and ports; and a minimum temperature stratification results from the use of air circulation.

Circle #85 on page 35.

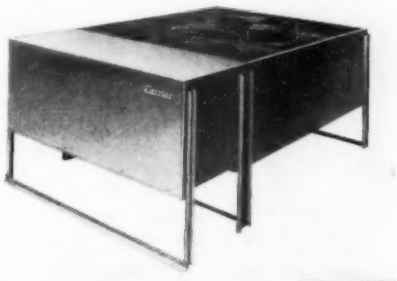
AIR SAMPLING INSTRUMENT MANUAL

A valuable reference published by the *Air Sampling Instrument Committee of the American Conference of Governmental Industrial Hygienists.* It is an up-to-date compendium of instruments containing comprehensive descriptive information on the uses, operating principles, physical descriptions, performance data, operating instructions, maintenance instructions, and commercial source, if any, for almost all of the air sampling instruments currently in use in the United States. In addition, it contains authoritative discussions on air sampling techniques and theory by distinguished authors including Professors Leslie Silverman of the Harvard School of Public Health, and Theodore Hatch of the University of Pittsburgh School of Public Health. **Purchase orders should be forwarded to: Business News Publishing Co., 450 W. Fort St., Detroit 26, Mich.** *$7.50 per copy.*

Rooftop Condensing Unit With Capacity Control

Purpose: From Carrier Corp. a 10-ton condensing unit with capacity control as standard equipment and designed especially for rooftop installation.

Features: Unit has vertical discharge propeller type fans giving it a low silhouette. Controls automatically unload two cylinders to give two-thirds capacity enabling operation under light loads.



Time guard control circuit prevents rapid cycling of the compressor and reduces starting load on the electric system.

Unit is zinc coated steel with a baked green enamel finish.

Circle #86 on page 35.

To receive information on any of the New Products, circle the item reference number on the postage-free reply cards on page 35, Communications Center.

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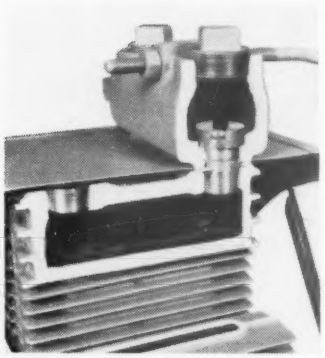

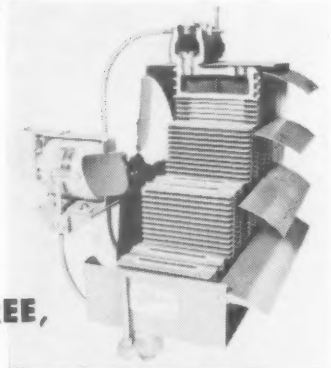

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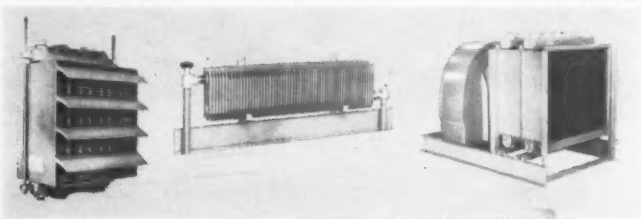


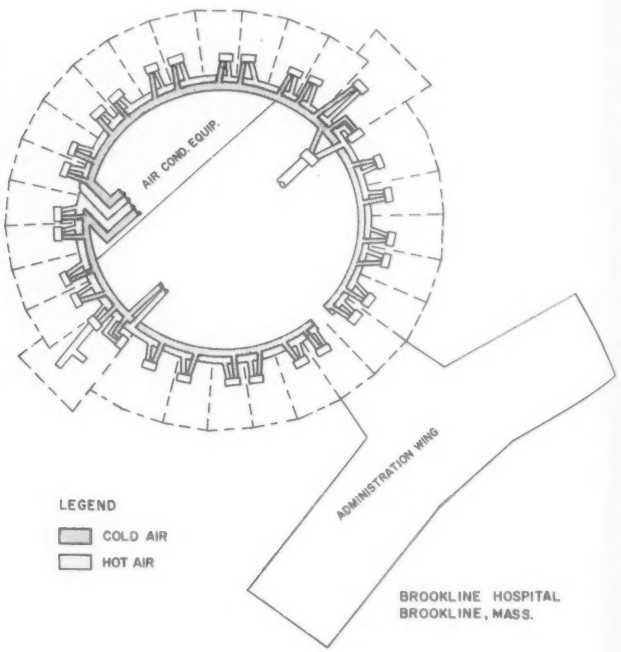
[For more information circle #29 on page 35 reply cards]

Professional Balancing of Air Distribution Systems

(Continued from page 27)

Mass., professional balancing and testing engineers. Leonhardt engineers found that the condition of imbalance and poor operation was the result of installation deficiencies, rather than improper control adjustments, fan speeds, etc., which are the more frequently encountered causes.

The following examples are indicative of the contributing causes discovered by the Leonhardt Company. Some fire dampers were found in a closed position. Splitter dampers were missing in certain specified locations. Slipping belts were found on exhaust fans. Sections of flexible tubing were crimped, creating static pressure losses. And the electronic filter was found to be off-center, creating air turbulence and fan inlet loss. The latter defect was corrected by enlarging the fresh air intake, and installing baffles and turning vanes to eliminate the turbulence.



The unusual nature of the conditions discovered by the Leonhardt Company points up the value of this specialized service. Not only was the air conditioning system placed in proper balance, but this comprehensive investigation assured that the system was in complete conformance with contract specifications: in materials, workmanship, and operation. It is extremely doubtful that this would have been achieved without their professional assistance.

With the constant advances being made in air conditioning facilities and the corresponding demand for precision design and installation, the engagement of a professional balancing and testing service is essential for efficient air conditioning performance. ▲▲

How Modern Manufacturing Methods Affect Ventilation

(Continued from page 21)

5 we chose the south wall of the foundry so that the uncontaminated air would flow over the largest number of workers in the plant—those in the pouring and molding area—up to the hoods over the operations where there was considerable lead given off. Thus we were assured that workers in the pouring and molding areas would always have uncontaminated air flowing through their areas and no air currents could carry leaded air back to them.

Evaluation of Exhaust System

The next point to emphasize is this—we measured the effectiveness of this industrial exhaust system not by the quantity or velocity of air being exhausted. These factors are considerations in the design of an exhaust system but they are not the basic factors we consider in evaluating the effectiveness of the system. The value of an exhaust system is judged by the amount of contaminant it leaves in the air.

The question may be asked as to why all these changes and installations in this bearing foundry were not made at once and thus achieve our purpose with what appears, at least on the surface, a minimum of effort. The answer is that the 4 or 5 steps taken to reach our ultimate goal were the economic, practical and fool-proof method of accomplishing our purpose. We demonstrated to the company that we were getting results as we went along and it was done in the most inexpensive way possible. It isn't always practical to make all the major changes and installations at one time. Production schedules and finances often require a slower, judicious approach.

Good practices in industrial ventilation have tangible rewards and are an effective tool in maintaining a high rate of production, a high standard of quality control and lower maintenance and depreciation costs. In the case of this foundry, the industrial exhaust system kept the company in the bearing business. They would not have been able to continue in business under the same conditions that existed prior to our work. This would have been true for compensation costs alone.

In fact, the compensation carrier watched our progress step by step and it was only because we did have good control results that they continued to insure the bearing company. It is also gratifying to us to know that there was a definite increase in production because of better working conditions. These better working conditions also resulted in better quality control—fewer rejects and better all-around operation.

Economics of Exhaust

It is hardly necessary to point out that exhaust systems are important in maintaining a good eye skill which is an essential factor in high production quality control. There is no more effective method than the removal of dusts and fumes from industrial operations to utilize eye skills to the best advantage. Frequency of breakdowns and high maintenance and depreciation costs are directly related to exhaust systems.

It is difficult to determine how many industrial operations could continue to produce quality material without exhaust ventilation. Consider such operations as spray painting, abrasive blasting, metallizing, grinding, production welding, and electroplating. Without exhaust ventilation, electroplating shops would corrode themselves out of business. The recovery of expensive process materials such as cobalt in the grinding of cemented carbide blanks, silver from silver plate buffing and polishing, and other highly expensive materials are important considerations in installing exhaust ventilation.

Recently we worked on a proposed system for exhausting a pugmill mixer. The proposal called for a canopy hood with 8000 cfm. By enclosing and making a direct connection to a top opening and partially encircling the barrel filling opening, we reduced the amount of air to 800 cfm. The company had been concerned about the loss of material but find that they now lose less than they did with no ventilation at all.

Recently we examined plans for a plating room installation and found that 68,000 cfm was specified with a series of overhead hoods. Through the use of hoods at the side and center of the tanks, we reduced the volume to 28,000 cfm, which proved to do an excellent job of control, to say nothing of the cost of installation. The company estimated that the saving in heating alone ran into thousands of dollars.

Check Fan Type

In going over the specifications for an exhaust system at a Michigan steel plant, we found that 16,000 cfm was needed to do an adequate job of exhausting the contaminants. The resistance of the system, however, was such that the specified fan would only exhaust 4000 cfm. We recommended the use of a different type fan that would exhaust the 16,000 cfm with the designed resistance in the system. Had they gone ahead and installed the specified fan, it would have been worse than having no exhaust system at all.

Some time ago we checked a ventilating system which had cost the company thousands of dollars but it was still falling short of doing a good control job. We recommended the installation of some baffles costing $165. We know that these baffles will make this installation satisfactory.

The examples of industrial ventilation outlined in this article are typical of those you may face in your own plant. It's important to remember that the best ventilation system, as has been shown, is not necessarily the most costly, or even the least costly. The best ventilation system is the one that keeps the level of harmful contaminants in the air at or below maximum allowable concentrations, at the least cost for equipment and its operation. ▲▲

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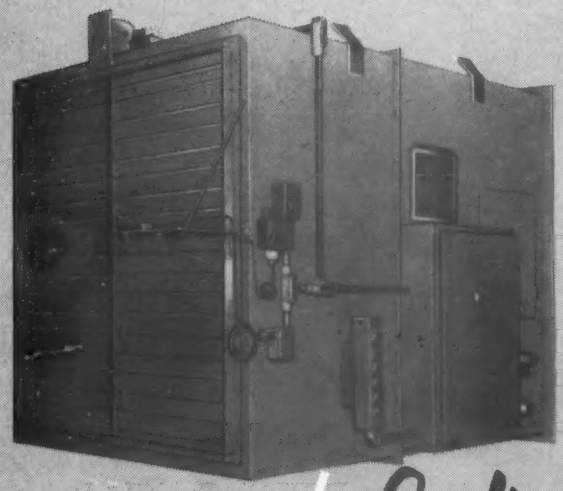

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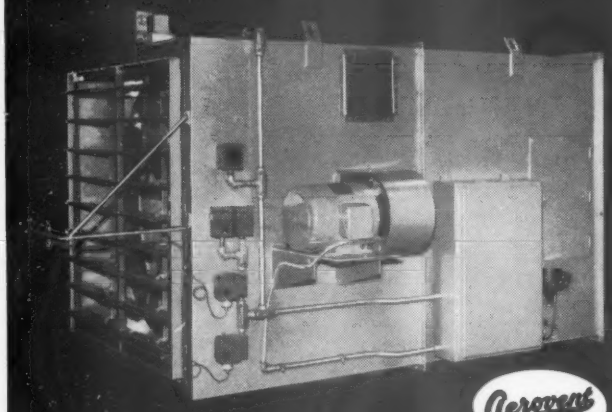

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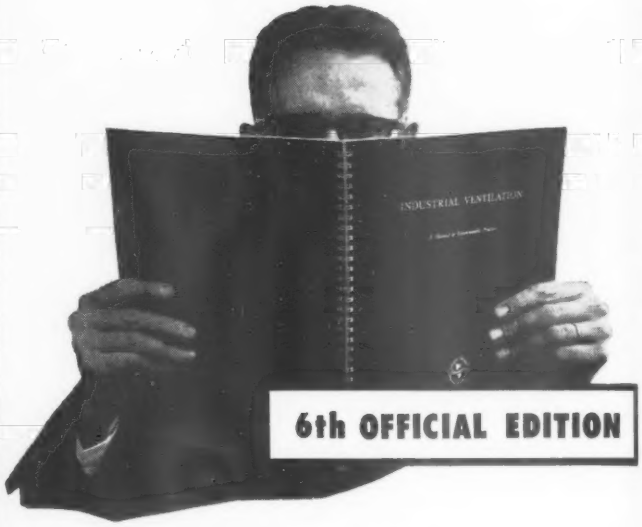

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Air Curtain Design

(Continued from page 22)

consist only of devices to start the heater at a fixed firing rate whenever the door opens and to shut it off when the door closes.

Where traffic through the door is heavy, a more elaborate control arrangement may be justified—perhaps fully-proportioning type regulated from outside air temperature.

A hot air door curtain cannot be fully effective if the building is under strong negative pressure created by exhaust systems without adequate replacement air. The blast of warm air, in such cases, must offset the combined inside negative pressure and outside wind velocity.

The easiest source of make-up air in an air-starved building is an open door, so that it is virtually impossible to screen out or temper the cold air entering through it.

In such situations, the basic problem of replacement air heating should be solved before an attempt is made to provide hot air door curtains. ▲▲

Among the manufacturers of direct gas-fired package air heaters for this purpose are:

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Metals Engineering & Mfg. Co., Detroit, Michigan
National Heater Company, St. Paul, Minnesota
Charles A. Strand Co., Detroit, Michigan
L. J. Wing Manufacturing Co., Linden, New Jersey

Process Air Design

(Continued from page 26)

since the lithium chloride solution decontaminates the air.

But the most vital purpose of the system remains the removal of moisture to prevent curling, fracturing and spotting of Formica sheets in process. This improvement, demanded by our process engineers to avoid potential damage in humid weather, has been effected in such a way that there is no day in the year when production is jeopardized by moisture.

This not only means greater assurance of product quality, but a great cost saving, since the scrap formerly occasioned by rejections in humid weather used to cost considerably more than the present cost of our conditioning system. And scrap from this cause is now an unknown occurrence. ▲▲

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